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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Non-intervention in Spain

IF people in all non-Spanish countries were to send arms, munitions of war, and volunteers to whichever side their fancy prompts them to favour, the danger to European peace would soon become very great. Probably very few outsiders really know much about the composition of the two parties which are now busily engaged in cutting each other's throats, but rumour suggests that Soviet Russia favours the Spanish Government because some of its supporters are Socialists and Communists, while Germany and Italy are said to be in sympathy with the insurgents because of real or imagined tendencies to Fascism among some sections on that side. The French Government, which is of the Left, apparently sympathises with the Spanish Government, but realises that if everybody sent active help to the Spanish party with which it is inclined to sympathise, a general European war would soon be appreciably nearer. M. Blum has therefore declared for non-intervention. Britain has taken the decided step of forbidding the export of all aircraft to Spain, however commercial those aircraft may be. Italy has agreed to forbid the sending of arms, munitions, and aircraft to Spain as soon as the French, British, Portuguese, German, and Soviet Governments have agreed to do the same. Other Governments have fallen into line.

Such a common policy is only the barest common sense. The fighting in Spain is a domestic matter which the Spaniards must settle for themselves. In form it is a rebellion, and neither side has the rights of a belligerent under international law. No outside nations can declare "neutrality" where there is no recognised war. For a foreign nation to send help to the insurgents would be an act of war against the Spanish Government, and to permit its nationals to send help would certainly be an unfriendly act. On the other hand, it is no business of any other country to help the Spanish Government to suppress an insurrection within its own territories. Spain must be left to settle its own affairs.

So long as the British Government placed no ban on the export of aircraft to Spain by private parties, no blame could attach to such parties who sold what they could to either side. Business is not usually concerned with other people's morals, and business men can hardly be expected to worry themselves over metaphysical questions about the rights and wrongs of a self-denying ordinance which does not prevent the fighting parties from getting their goods, but means that it is foreigners and not British makers who reap the profit. Such questions are for Governments to decide. But once the British Government has taken its stand, as it has, it becomes very wrong indeed for anyone to try to evade the ban. If it is the case that two employees of a British firm tried to fly an aeroplane to Spain on their own responsibility (an aeroplane, moreover, which is said to have been the property of their employers) one can only rejoice that the attempt failed; though the damage to the two adventurers is regretted.

A Strange Story

At the same time it is to be hoped that there is no truth in the story reported by the *Echo de Paris*, to the effect that the workmen in a French factory threatened to strike unless they were allowed to build two aeroplanes in their spare time for the Spanish Government, and that M. Cot, the French Air Minister, has consented to those two aeroplanes being delivered. The members of the French Government may privately sympathise with the Socialists in Spain, but if they let such sympathies affect their official actions they will be stirring up trouble. As it stands, the story is incredible, and it is much to be hoped that it will soon be officially denied.

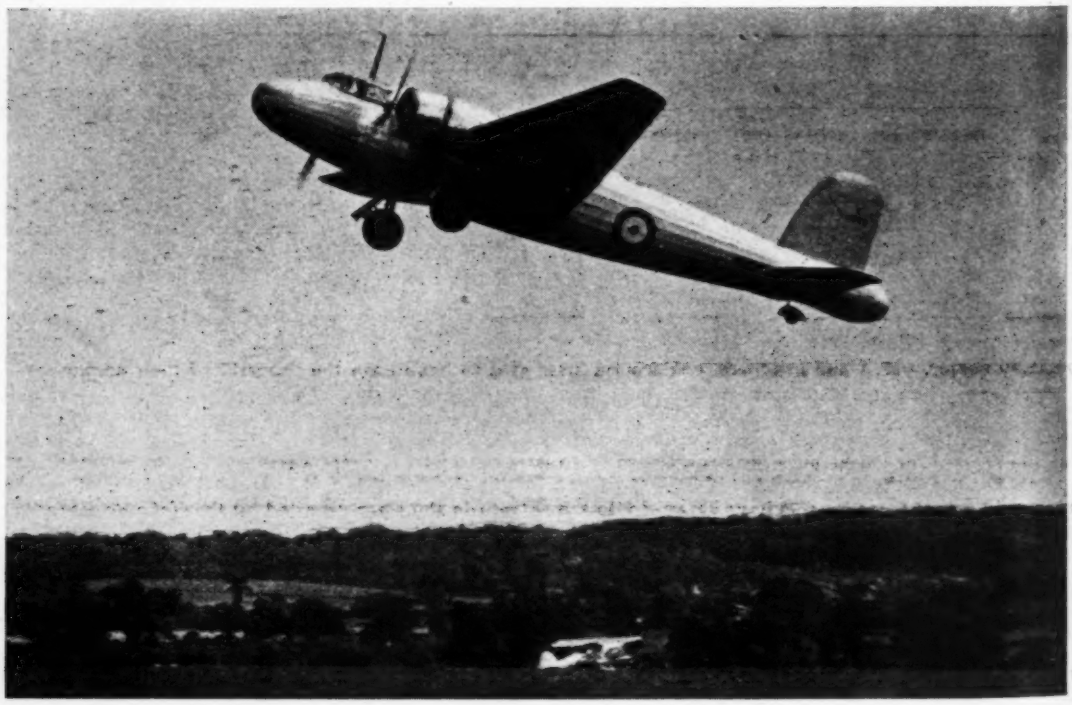
Of the efficacy of the air bombing which has been taking place by both sides in Spain, it is impossible to judge. Reports from both sides are obviously exaggerated and must be received with caution. It is certainly true that so far the air arm has not brought the fighting to a speedy end, but as the air power on both sides is probably small, any conclusions drawn from the facts, so far as we know them, would probably be fallacious. It can only be hoped that this sanguinary and merciless struggle will soon be brought to an end.

Air-arming Cyprus

IT often takes a scare to make a British Government do an obviously sensible thing. One result of the recent strained situation in the Mediterranean has been to bring Cyprus into the limelight, and probably to put it on the air map. One can only wonder that this was not undertaken before, for the island is a focal point for a naval and aerial Power in the Mediterranean. Hitherto, while Gibraltar dominates the western Mediterranean, and Malta lies in the narrows which connect and separate the eastern and western zones of that sea, we have tended to think of the eastern zone merely in terms of Egypt and Palestine. Even in peaceful times it is strange that the advantage of having another air centre on an island in the eastern part of the sea did not come home to the minds of our strategists. British thoughts only seemed to turn to Cyprus with practical intent after Italy had made Rhodes an air base. Now it is reported that an air base is to be constructed in Cyprus at a cost of a quarter of a million pounds. Sir Robert Brooke-Popham has inspected the island, and only quite recently a flight of R.A.F. machines from Egypt flew there to undertake a more detailed and photographic survey.

Cyprus is roughly 250 miles from Rhodes, and about the same distance from Jerusalem. It is about 300 miles from Alexandria. The nearest land on the continent of Asia is Cilicia in the Turkish Empire, 44 miles away, while due east, at a distance of 69 miles, lies the French mandated territory of Syria. All sorts of permutations and combinations of international situations are possible in the future in the eastern Mediterranean, but it is hard to imagine one in which it will not be advantageous to the British Empire to have an air base in Cyprus.

Cyprus came into British hands as a result of Turkey joining the Central Powers in the Great War. Its acquisition might be described as a by-product of the war. From 1878 to 1914 the British had administered the island, paying an annual tribute to the Sultan. When Turkey declared war, Britain formally annexed Cyprus as a matter of course. It goes without saying that the administration and prosperity of the island have been improved under British rule, but hitherto this Crown Colony has had little publicity in the United Kingdom. Now a definite attempt is being made to popularise Cypriot cigarettes and wines in Great Britain, and as they come in as British Empire products they will be cheap, and may well achieve popularity. The establishment of an Air Force station is sure to bring further prosperity to the island and to lead to greater interest being taken in it by the people of Great Britain. The climate is warm and sunny, but temperate, and there would seem no reason why Cyprus should not become a holiday resort for British people who wish to escape the winter of the British Isles but who prefer to spend their holidays in a land where the Union Jack is flying overhead.



OVER-RIDE : The new Vickers "geodetic" medium bomber with its twin Pegasus engines receiving over-ride boost, sails up like a fighter. This machine represents a new class of bomber, the development of which is receiving close attention in this country. (*Flight* photograph.)

The Outlook

A Running Commentary on Air Topics

Air Publicity

THE Air Ministry has always been yards ahead of the Admiralty and the War Office in the important matter of publicity, thanks largely to its wise employment of a Press Officer who is both an experienced journalist and an ex-Officer and pilot of the Royal Air Force. Now, we are told, the whole system of air defence of London is to be filmed for exhibition during the coming winter. As the guns and searchlights belong to the Territorial Army, doubtless the War Office is co-operating with the Air Ministry on this occasion.

What seems peculiar about the prospectus of this film is the announcement that a duplicate of the central control room is to be built in the studio and will be filmed. In the first couple of years in which Air Exercises were held, Press correspondents were allowed to enter more than one of the control rooms, but in recent years such visits have been barred. Now a replica of the central control room is to be filmed for all to see. If it was harmless for the correspondents to see such a room in two years, why did it become so dangerous to allow them to enter it in subsequent years? And if the safety of the nation depended on keeping this room secret for the last five years or so, why has it suddenly become innocuous to have its interior workings broadcast in every cinema in the country? Or will it be merely a "stunt"?

Unlucky

RECENT events appear to provide proof of the old saying that misfortunes never come singly. After a period of immunity, British air transport companies seem to have had more than their fair share of ill luck, the latest firm to be singled out being Imperial Airways, whose flying boat *Scipio* was damaged and sunk after alighting in a very rought sea in Mirabella Bay, Crete, last Saturday.

Details of the mishap are not yet available, but the flying boat was on its way from Alexandria to Brindisi and alighted in Mirabella Bay in the normal course for the purpose of refuelling. Apparently there was a storm at the time, and the sea was very rough. It would seem that the machine was damaged on striking the water, and two of the passengers were killed, a third being seriously injured. Four other passengers received minor injuries only, and members of the crew suffered injuries, the exact nature of which has not been announced.

An official inquiry has been ordered by the Greek Government, and until its results are known it is not likely that a detailed account of events will be available. In the meantime one may take comfort from the fact that in this instance there was no technical failure. Reports that the machine had sent out distress signals before the accident have been officially denied, and one can only assume that the sea was extremely rough and that, in alighting, the machine was struck by a wave at a critical moment, the shock being sufficient to cause some of the occupants to be seriously injured and the aircraft to be so badly damaged that it sank shortly afterwards.

Captain A. S. Wilcockson is one of the oldest of Imperial's pilots in years of service, and has flown close upon 11,000 hours. Before the formation of Imperial Airways he was one of the early Handley Page Transport pilots, and one may take it for granted that the mishap was not due to any fault in piloting. The *Scipio* flying boat was one of a number known originally as the Kent Class, and they have established an excellent record for safety and reliability, with something like one million miles flown without injury to a passenger. It appears to have been a case of the sea being too rough for the size of the flying boat.

Diesel Triumphs

IT is noteworthy that two events have occurred during the last few days which lend point to the reference on this page in last week's issue of *Flight* to the mistake of letting the Diesel aero engine be neglected. The German airship *Hindenburg* has flown from Frankfort to Lakehurst and back to Frankfort within a period of five days, crossing the Atlantic twice; and a Junkers monoplane has flown non-stop from the Junkers aerodrome at Dessau to Bathurst, West Africa, at a speed of 186 m.p.h.

It is not without its significance that both types of aircraft are fitted with Junkers Diesel engines. While no one would claim that these flights could not have been made with petrol-engined aircraft, the fact that they *have* been made with Diesel engines shows that Germany has been well advised to continue development work on this type of power plant.

Germany has proved the only country to have much luck with airships, and the success of the *Hindenburg* has been amply deserved by the persistence with which Germany has backed her belief in airships. She has gone some way towards perfecting the Diesel aero engine, and it would be extremely unwise of Great Britain to let Germany or any other country establish a monopoly in Diesel engines like that which she has already achieved in airships.

The warning is there, plain for everyone to see, and it is up to this country to heed it.

Out of the Picture

IT was, we believe, M. Laurent Eynac (who used to take turns with M. Flandin at being French Air Minister) who once said that the world record is a nation's propaganda. If he was right, Great Britain is not exactly holding up her end at the moment. A chart, published on p. 228, has been prepared by *Flight* from the last issue of the Bulletin of the *Federation Aeronautique Internationale*, and shows how the four most important world's records have grown. These four are: speed, distance in a straight line, distance over a closed circuit, and altitude.

The last time Great Britain figured in the list of world's records was in 1933, when Gayford and Nicholetts flew non-stop from Cranwell in Lincolnshire to Walvis Bay in South Africa in the Fairey monoplane with Napier Lion engine. The previous year Cyril Uwins set up a world's altitude record by reaching 13,404 metres (43,976 ft.) in a Vickers Vespa biplane, fitted with Bristol Pegasus engine. Landplane speed records and records of distance in a closed circuit have never been attempted by British pilots, and the world's speed record for seaplanes (which are not included in the chart) was taken from us by Italy. ***Great Britain to-day does not hold a single worth-while world's record.***

Experimental aircraft are being built by the Bristol company for the Air Ministry, and it is very much to be hoped that the scientific studies for which they have been designed will leave time and opportunity for attempts at a couple of world's records.

SPORT IN THE MIDLANDS

Racing and Relaxation at Castle Bromwich : Another Trophy for the Henshaw Home

(Illustrated by "Flight" Photographs)

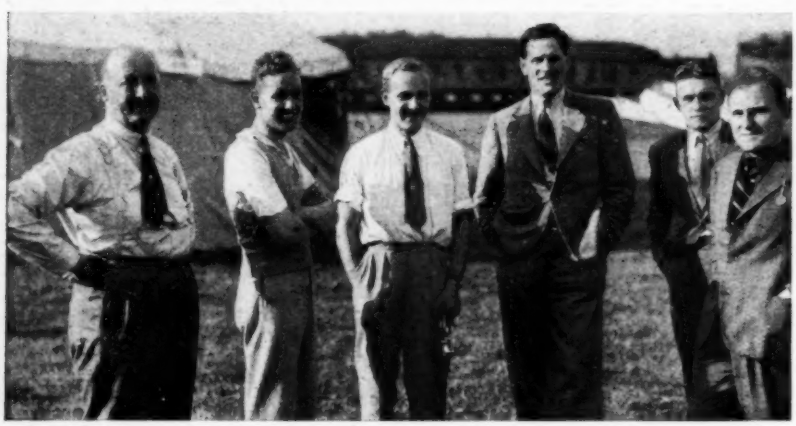
IF there is one thing the Midland Club has learned during its twenty-seven years it is how to throw, organise, sponsor or instigate an aerial "At Home." Their party at Castle Bromwich last Saturday was just what the doctor ordered for jaded private pilots: attentive hosts and some pretty flying to watch from the lawn while awaiting the finish of a well-planned race.

The big event of the day was the Contact Air Race, but at such a gathering it is always a good thing to provide for chance as well as skill, so there was an arrival competition. A number of the sixteen "Contact" racers, already on the aerodrome for official verification, took off to re-arrive. One of their number, F/O. Clouston, touched down nearest the set time. Mr. H. W. Badger's Hawk, approaching in company with a B.A. Swallow, omitted to take into account the flatter glide of its consort and undershot. An airscrew tip was smartly carved off by the boundary fence, and the offending wire snatched off by the undercarriage. The Hawk stumbled but didn't fall. It was necessary to withdraw it from the Contact race. Mr. Kirkby's Hornet also withdrew.

The Contact Air Race is an annual event organised by the Midland Aero Club, Ltd., in conjunction with the Leicester, Northampton, North Staffordshire and Nottingham (Tollerton) Clubs. The main qualifications for entry are amateur status and fifty hours' solo; the course Castle Bromwich, Sywell, Braunstone, Tollerton and Meir; and the regulations call for into-wind landings and take-offs and the acquisition of an official's signature at each of the controls.

J. D. Kirwan's Aeronca, borrowed from Hanworth, was limit machine, and the field between it and F/O. Clouston's Miles Sparrow Hawk, which started scratch, was a Moth (T. N. Winning), Swallow (L. W. Hamp), Moth (J. Jurdon), Hawk (J. McGuinness), Monospar S.T.4 (G. S. Davison), Swift (H.G. Everitt), Hornet Moth (A. Kirkby), Monospar S.T.25 (Seth Smith), Monospar S.T.25 (H. C. Macphail), Leopard Moth (A. Henshaw), Falcon (J. N. Addinsell), Gull (C. S. Napier), and Hawk (E. F. Walter).

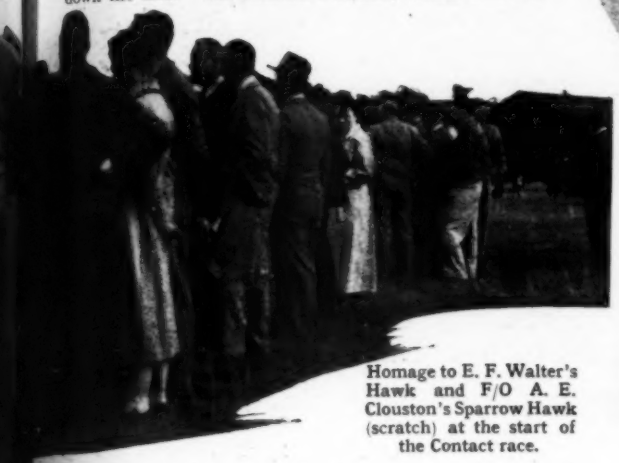
Final counsel was given to participants by Mr. W. H. Sutcliffe, secretary and chief instructor to the Midland Club. On explaining that the "post" was represented by a line in the aerodrome circle, which had to be crossed below 500 ft., he was immediately interrogated as to its length, which question reflected great credit on the studious Messrs. Dancy and Rowarth, who not only worked out the handicaps, but sent the



General satisfaction : from left to right, Messrs. Henshaw Senior and Junior, passsenger and crew respectively of the victorious Leopard ; Mr. Seth Smith (Monospar S.T.25), the second man home ; Mr. C. S. Napier (Percival Gull) who was placed third ; Mr. Napier's passenger, Mr. W. S. Moseby ; and Mr. L. Castlemaine, who flew with Mr. Seth Smith.

machines off personally, in accordance with them.

The start was tranquil and orderly, the least impressed spectator being F/O. Clouston's dachshund who, on settling down to snooze in the shade of a wing, found the aeroplanes disobliging enough to fly off and race, which meant that as the red flag dropped he was forced to slink off farther and farther down the line. The Heston Phœnix, which came in



Homage to E. F. Walter's Hawk and F/O A. E. Clouston's Sparrow Hawk (scratch) at the start of the Contact race.

Lowdell low down: Mr. George Lowdell, who put up two masterly aerobatic displays, and his Hawker Tomtit in the act of *strafing* the clubhouse.

while a competitor sat, hand on throttle, eye on flag, obligingly tucked itself away by the far boundary until such time as it could make its way without hindering or being hindered to fall in with the swelling ranks of the visitors.

The Sparrow Hawk was just streaking away when Mr. George Lowdell opened up the Wolseley in the Hawker Tomtit and bored steeply up into the blue in the best "through the gate" military fashion to entertain the assembly. His intimate dives at 170 m.p.h. occasioned a noticeable fidgeting on the part of certain guests sunning themselves on the lawn, but as he sailed along on his back at a comfortable height and coaxed the Tomtit over in vertical and horizontal planes everything was hushed save for murmurs of approval. Lowdell and the Tomtit are old friends, for until "George" joined Reid and Sigrist some time back he was the Wolseley test pilot.

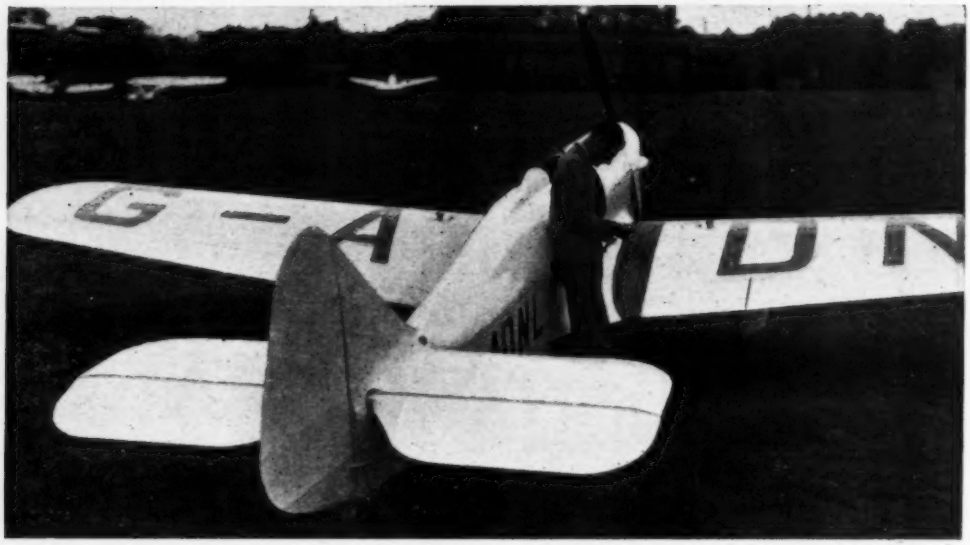
Barely had the Wolseley clicked to a standstill than Lowdell was in one of the smart, red Moth Majors of the Midland fleet and taking off in the company of Mr. R. L. Jackson, similarly mounted, to low-bomb a distressingly agile Morris-Cowley as it scooted around before the clubhouse, while Mr. William Courtney discoursed on the convertibility of gentle civil aeroplanes to terrifying weapons of war.

Then, of course, there were demonstrations, and most enlightening they were. First Mr. Shoesmith in the Hillson Praga with its unimpeachable flying qualities at both limits of the speed range; the Cirrus Minor-Swallow (Mr. Bay) which, as the announcer explained, was turned down by the Air Ministry for official training purposes because it was too safe; the aristocratic Dragonfly with Mr. Guy Robson at the wheel (the single-engined flying was comforting to behold), and the delightful and efficient Heston Phœnix shown in great style by Mr. Hordern. An interesting, if somewhat less stylish visitor, was Mr. Yardley's Westland Wigeon from Walsall way.

Meanwhile a 'phone message came through from Meir to say that Kirwan, Winning, Jurdon, Hamp and Davison had arrived in that order. Macphail's Monospar was at Braunstone with a flat tyre and had withdrawn.

About an hour and twenty-six minutes after the start the Henshaw Leopard swept in over the line with Seth Smith's S.T.25 chasing its tail. C. S. Napier was third with Clouston's Sparrow Hawk just over two minutes behind him.

Is that quite clear?: The energetic Mr. Sutcliffe advises and instructs competitors prior to the start of the Contact race.



F/O. A. E. Clouston clears up a matter of regulations before the start with the support of his Miles Sparrow Hawk, which, incidentally, put up fastest time.

Competitors reported good organisation at the controls, and that the taxying complications which might have resulted through over-eagerness on the part of competitors to get on the line after checking in did not impede operations.

The official times, handicaps, places and speeds were as follows:—

Pilot.	Machine.	Handicap.	Place.	Average Speed.
		m. s.		
Kirwan	Aeronca	0 00	10	71¼
Winning	Moth	6 59	5	77
Hamp	Swallow	17 06	11	78
Jurdon	Moth	19 49	8	83½
McGuiness	Hawk	27 06	12	84½
Davison	Monospar S.T.4 ...	33 04	—	Disqualified
Everitt	Swift	35 50	9	96
Seth Smith	Monospar S.T.25 ...	41 44	2	111¼
Macphail	Monospar S.T.25 ...	42 23	—	Returned
Henshaw	Leopard	46 39	1	118
Addinsell	Falcon	48 54	6	110
Napier	Gull	50 30	3	120½
Walter	Hawk	55 50	7	119
Clouston	Sparrow Hawk ...	62 20	4	135

The speeds, of course, take into account time spent at the controls.

Mr. Winning, after completing the course, set his Moth down in a nearby playing field through petrol shortage, and from all accounts must have made a good job of the landing. The Moth came home by road with folded wings and a guilty look.

Mr. Davison was disqualified for landing out of wind at Sywell.

Finally, in the cool of the evening, an inter-club relay team race was flown off. The rival factions were the Midland Aero Club, Yorks County Aviation Club, and Midland Aero Club private owners. A measure of skill was demanded in that batches of machines were required to take off, fly round one of the local landmarks, and land up to a mark on the aerodrome. If over, they were required to get back to it before the next member of the team could take off for his effort. The winners were the York County Aviation Club.

Then victors and vanquished repaired to the clubhouse where Mrs. Dennison, wife of Major G. V. Dennison, the president, made presentations.

Mr. Henshaw received the Lord Austin of Longbridge Trophy and a cheque for a hundred pounds presented by the Austin Motor Co., Ltd.; Mr. Seth Smith, the Midland Trophy (presented by the Midland Aero Club) and a cheque for twenty pounds; Mr. C. S. Napier, a cheque for ten pounds; and F/O. Clouston, the Dunlop Trophy (presented by the Dunlop Rubber Co., Ltd.) and a cheque for twenty pounds for putting up the fastest time. The fifty pounds prize money apart from that received by the winner was also presented by the Dunlop Rubber Co.

THE ALTITUDE RECORD

M. GEORGES DÉTRÉ, who, as already recorded in *Flight*, has broken the former altitude record of 47,352ft., set up by the Italian, Donati, in a Pegasus-engined Caproni biplane by flying to 48,674ft. in a Gnôme-Rhone engined Potez 50, gave a vivid account of his sensations during the flight to a representative of *The Daily Telegraph*. The physical effort, he said, can be very severe. On several occasions he felt very "strange" and asked himself if he was going to lose consciousness. After a disagreeable sort of numbness he felt so faint that he was scarcely aware of his surroundings. Then he had a sudden burst of energy which renewed his enthusiasm and filled him with elation. But as he came down from the record height to 24,000ft. he was troubled by acute head pains, which felt like staggering blows.

The Potez biplane used was that in which Mlle. Maryse Hilz gained the women's world's altitude record last June by reaching 46,965ft. The engine is a special Gnôme-Rhone K.14 Mistral Major with a compression of 7.25:1, as compared with the 5.5 or 6.0:1 of standard K.14's, and a supercharger running at higher speed.

The K.14 engine has provided the basis for the design of the Alvis Pelides 14-cylinder two-row 1,000 h.p. engine now in production in this country, and is similar to the 2,000-odd Mistral Majors produced by the Gnôme-Rhone company. The British-built Pelides will incorporate a number of improvements. The power output will be considerably augmented by the introduction of a new cylinder design and improvements in the supercharging; the accessory installation is being modified and the weight reduced.

Air Ministry Official for Newfoundland

MR. H. A. LEWIS DALE, Deputy Director of Works at the Air Ministry, is due in Newfoundland on September 10 to approve plans in connection with the Newfoundland jumping-off points for the transatlantic service.

His investigation will cover both flying-boat harbours and a proposed landing-ground on a site at Hatties Camp, now covered by virgin forest.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

THE former Arrol-Johnston motor car factory at Dumfries may be re-opened to manufacture aero engines under Italian patents.

The engagement is announced of Mrs. Elise Battye to Mr. Leonard Hackett, sales manager of Phillips and Powis.

The War Commissariat states that the Soviet Air Force will soon be as large as the aggregate of the air services of all other countries.

Mrs. Beryl Markham, a 31-year-old English airwoman, will attempt a non-stop solo flight from London to New York shortly in a Percival Vega Gull.

The Air Ministry proposes to take over retort houses and other buildings at Gaythorn Gasworks, Manchester, in connection with balloon experiments.

The Zeppelin *Hindenburg* has created a new record by making the round trip from Frankfort to Lakehurst and back in 111 hr. 50 min. This included a seven-hour halt at Lakehurst.

Two new company registrations of unusual interest are recorded on p. 238. One is of Imperial Airways (Bermuda), Ltd., and the other of the Caproni Agency Corporation (England), Ltd.

GROOMING AT GRAVESEND: Capt. Percival superintends the preparation of some of his products for the Schlesinger Johannesburg Race. In the foreground is the 225 m.p.h. Mew Gull to be flown by Capt. Miller, which is receiving a Ratier variable pitch airscrew

THE PATRON: Mr. I. W. Schlesinger, donor of the £10,000 prize money for the Johannesburg Race, leaving Waterloo with Mrs. Schlesinger for South Africa last Friday.

Twenty-five Years Ago

(From "Flight" of August 26, 1911.)

"The first lady to obtain an aviator's certificate from the Royal Aero Club of the United Kingdom is Mrs. Maurice Hewlett, who made the necessary flights on Friday of last week at Brooklands. Mrs. Hewlett has been taught by M. Blondeau, with whom, in partnership, she has a flying school at Brooklands."

Workers at the Bloch factory in France decided to present two machines built for the French Government to the Spanish Popular Front, offering to "buy" them by working overtime. They threatened to strike unless they received satisfaction.

The Air Ministry warns pilots that Service aircraft will be flying at night without navigation lights within a radius of twelve miles from Biggin Hill from sunset to sunrise the following day, during the period August 24 to September 6 inclusive at altitudes above 6,000 feet.

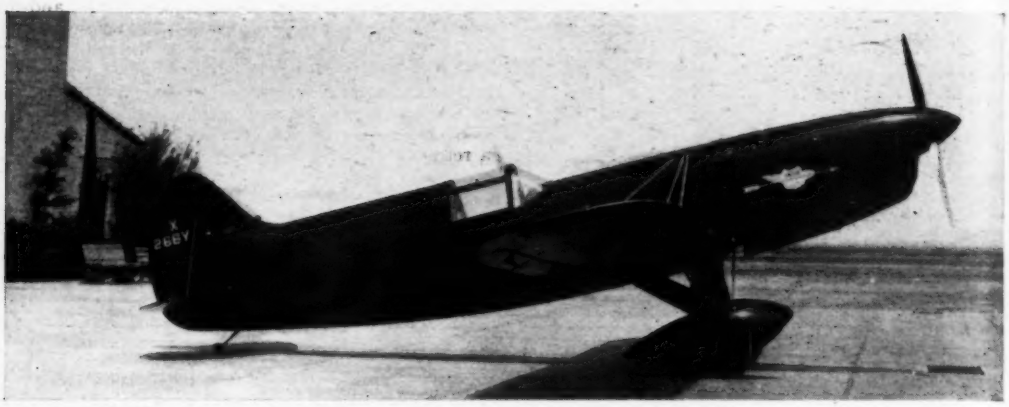
One of the new diesel-engined Junkers Ju.86 monoplanes has flown the 3,728 miles from Dessau to Bathurst, West Africa, non-stop in 20 hours, the average speed being 186.4 m.p.h. The pilots were Herr Achterberg and Capt. Untucht of the Junkers company.

Mrs. Dorothea Canfield, well known in western North Dakota, U.S.A., for her aerial coyote hunting, has been killed in a crash. When hunting coyotes Mrs. Canfield flew the machine while her husband fired at the animals with a swivel-mounted shot gun.

Joseph Smith and Arthur Gargett, woodworkers employed by Airspeed, Ltd., crashed at Portsmouth last Thursday in a Courier which they had taken without the permission of the firm and which they intended to fly to Spain Neither was a qualified pilot.

Forthcoming Events

August 28-29. Southend Flying Club: Week-end "At Home."
August 29-30. Cinque Ports Clubs: International Rally and Wakefield Cup Race.
August 29-Sept. 6. British Gliding Association: Annual Competition, Gt. Hucklow, Derbyshire.
August 30. Gordon Bennett Balloon Race, Poland.
September 4-5. Magyar Athletic Club Motor Section: International Flying Meeting.
September 5. Bristol and Wessex Aeroplane Club and Bristol Branch, R.Ae.S.: Garden Party.
September 5-6. Aero Club of Hungary: Week-end Aerien.
September 12. London Aeroplane Club: Hatfield Garden Party.
September 12. Rochester Empire Air Week Display.
September 13. Aero Club de France: Coupe Deutsch Race.
September 19. Cardiff Aeroplane Club: London-Cardiff Race.
September 19. Three Counties Air Race, Hereford.
September 20. London Air Park Club: Display.
September 29. London-Johannesburg Race.
October 25. Aero Club de France: Saigon Race.
November 13-29. International Aero Exhibition, Paris.



The sporting lines of the new Brown B-3 monoplane, described below, are seen to advantage here.

THREE from ABROAD

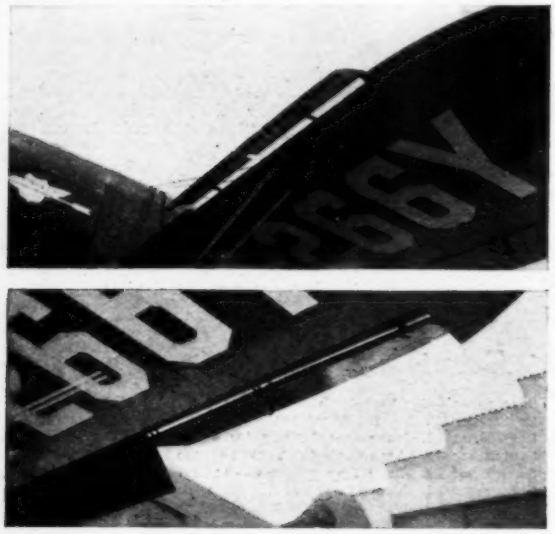
Monoplanes for the Sportsman, Air Force and Navy: British Features

THE development of aeronautics must necessarily be conducted on a give-and-take basis. Ideas must continually be interchanged, with the result that many of the world's finest aeroplanes are *pot pourris* composed of the pick of international ingredients.

Great Britain does her share in contributing to the common store of technical developments, and we find that the new American Brown B-3 monoplane described hereafter incorporates Handley Page slots and flaps and that Bristol Mercury engines are specified for the Dutch Koolhoven bomber.

The Brown B-3

Brown-built racing monoplanes are held high in popular esteem at the American National Air Races, and the success they have achieved has encouraged the manufacturers, the Lawrence W. Brown Aircraft Company, of Los Angeles, to build a machine suitable for private ownership, the design being based on that of *Miss Los Angeles*, perhaps the best-known Brown model. Although the new machine is primarily a civil type, negotiations have been proceeding with several governments which may result in a military version for fighting or observation.



"Close ups" of a Handley Page slot and the flap and aileron arrangements on the new Brown monoplane.

Essentially, the machine is a wire-braced low-wing monoplane with fixed undercarriage. The construction is mixed: welded steel tubing is used for the fuselage; the wings are of wood with wire bracing; and the covering is of fabric, except for the engine cowling and decking round the pilot's cockpit.

Although designed as a two-seater with dual controls the first machine of the series has been arranged as a long-range single seater to special order. A sliding hatch is fitted over the cockpits.

The chief distinction between the machine and its sporting ancestors is the provision of Handley Page automatic slots, manually controlled slotted flaps and slotted ailerons.

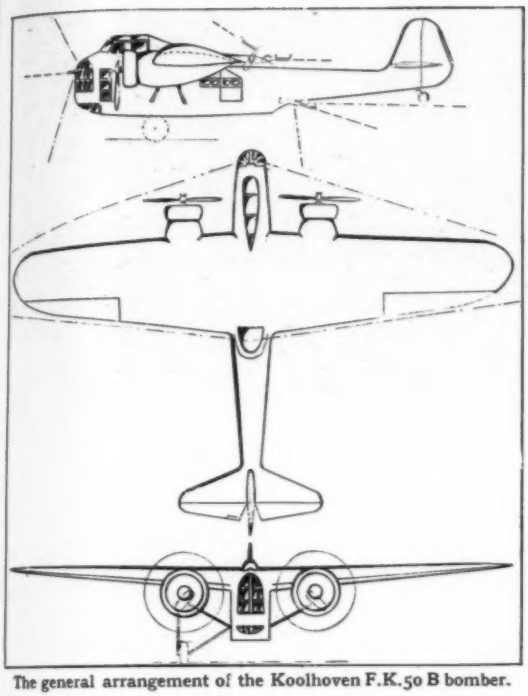
A further outstanding feature is the use of the newest 250 h.p. supercharged Menasco six-cylinder inverted, in-line, air-cooled Super Buccaneer engine, which is installed in a cowling arranged on the N.A.C.A. principle with an annular slot at its rear end. The power plant is rated at 6,000 and will deliver 290 h.p. at sea level for take-off. Although it has been announced as optional equipment for the new Lockheed 12 twin-engined transport, and will be specified for one or two of this year's crop of new machines for the National Air Races, it is introduced commercially for the first time in the new Brown.

An unusually wide speed range is claimed, the landing speed being about 40 m.p.h. and the maximum 205 m.p.h.

The prototype has been specially equipped for a private owner and carries blind-flying equipment, two-way radio and engine temperature thermocouple. A fully controllable Hamilton Standard airscrew is likely to be installed in the near future. The main data are as follows: Span 32 ft., length 26ft., weight empty 1,850 lb., gross weight 2,650 lb., wing area 150 sq. ft., wing loading 17.6 lb./sq. ft., power loading 10.6 lb./h.p., maximum speed 205 m.p.h., cruising speed 190 m.p.h., landing speed with flaps 40 m.p.h., landing speed without flaps 60 m.p.h., service ceiling 18,000 ft., normal cruising range 600 miles.

The Koolhoven F.K.50 B

Although considered as a development of the Koolhoven F.K.50 commercial machine described in *Flight* of October 3, 1935, the new Koolhoven twin-engined bomber resembles that machine only in structure. Outwardly there is little which tells of its ancestry. From the military standpoint the type seems well planned and is blessed with quite an extraordinary performance; with two Bristol Mercury



The general arrangement of the Koolhoven F.K.50 B bomber.

VI.S. engines it is claimed to be capable of 248 m.p.h.

As the structure is generally similar to that of the F.K.50 the following description will deal mainly with the military features.

The fuselage is arranged to accommodate a crew of four. In the nose is a transparent turret for a single machine gun, the angles of fire being 70 degrees to port and starboard and 50 degrees upward and downward. The bomb aimer, who also operates the wireless, is located behind the turret and is able to communicate directly with other members of the crew. The fuselage has been specially reinforced in order to avoid vibration of the bomb sight. If necessary the bomb-aimer can easily replace the pilot, whose enclosed cockpit is situated directly in front of the wing. The pilot has blind-flying instruments and emergency bomb releases.

Aft of the wing are two further gun positions. The upper one has a collapsible top, which, when open, shelters the gunner against the pressures of the airstream, and the lower one can be operated by the same gunner, as the floor between the two posts does not cover the entire width of the fuselage. The lower gun can fire 90 degrees to the right and left and 90 degrees downwards. The bomb racks are located on the C.G.

Unlike the commercial machine, the bomber incorporates a retractable undercarriage. This is fitted with Koolhoven oleo shock absorbers, low-pressure tyres and hydraulic brakes, and can be retracted by a single movement on the part of the pilot. A signal gives warning of the exact position. When raised the wheels are housed in the engine nacelles.

The machine will take engines of about 700 h.p. the following performance figures relating to it as fitted with two 605/645 h.p. Mercury VISs, which are rated at 12,500 ft. Controllable pitch airscrews are specified.

The main data are: Weight empty 7,165 lb., gross weight 12,787 lb., bomb load 2,200 lb., cruising speed at 15,580 ft. 223 m.p.h., landing speed with flaps and without bomb load 62 m.p.h., climb to 19,680 ft. 18 min., absolute ceiling 28,215 ft., range at cruising speed 710 miles.

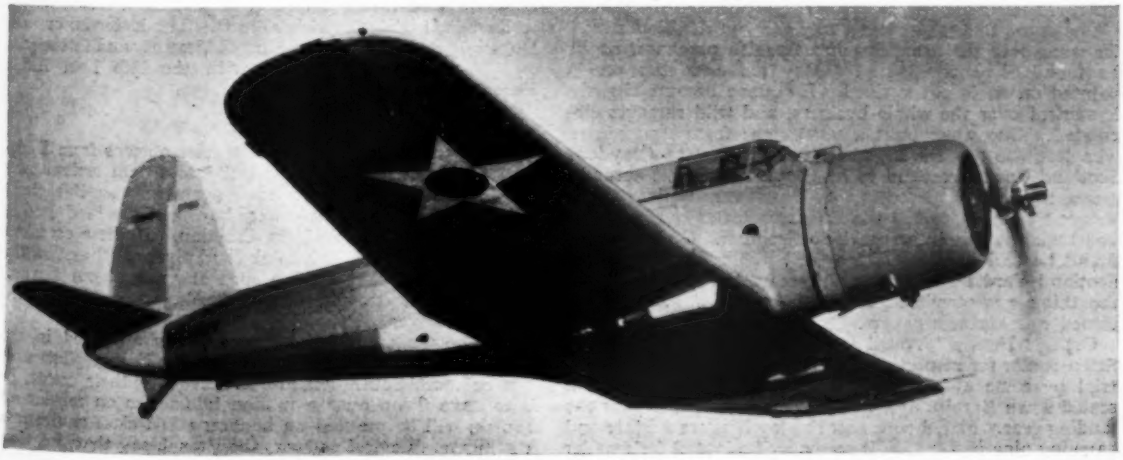
Vought Scout Bomber Monoplane

A naval air service cannot afford to disregard progress made in the design of military aircraft intended only for land operation. Due to special requirements in the matters of design and equipment ship-planes are usually slightly inferior in all-round performance as compared with corresponding landplanes, but with the adoption of the monoplane the margin is being kept small. The U.S. Navy has been experimenting with a number of scout bombers, dive bombers and fighters—all monoplanes—and has ordered large batches for service equipment.

The Vought XSB2U-1 is an experimental scout bomber monoplane of metal construction with fabric covering. Its engine is a fourteen-cylinder, two-row Pratt and Whitney Twin Wasp Junior of about 700 h.p., and the airscrew is one of the new constant-speed Hamiltons. The cowling has flaps for controllable cooling.

One of the most interesting features is the retractable undercarriage, each half of which is arranged to twist during retraction so that the wheel lies flat within a recess in the wing. This arrangement saves structural complication as compared with the more usual laterally retracting gear.

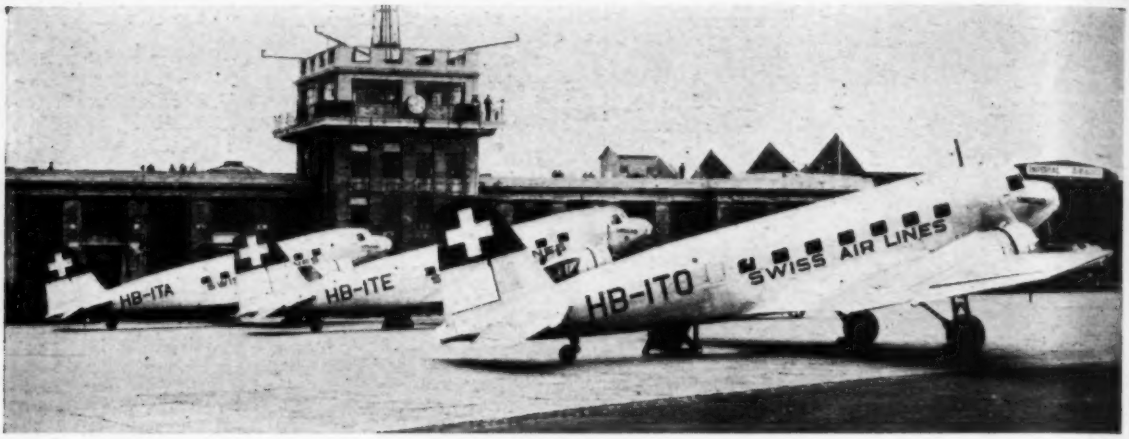
Pilot and observer are carried in a transparent enclosure. A Browning gun is fitted to a track-type mounting at the rear, and the pilot has a similar weapon. Night flying equipment and arrester gear to engage with the transverse cables on the deck of an aircraft carrier are carried.



An enlightening view of the new Vought scout bomber with Pratt and Whitney Twin Wasp Junior engine and constant-speed airscrew.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —



THE HOLIDAY RUSH: An unusual sight at Croydon on a recent Saturday, when the Swissair Douglases carried a record amount of traffic between London and Switzerland.

THE WEEK AT CROYDON

Spanish Rumours : Potentates : The Logical French : Seventeenth Anniversary of the London-Paris Service : Aerial Abracadabra

TOWARDS the end of last week the authorities did what they could have done (presumably) at the start of the Spanish trouble, and put an embargo on export of civil aeroplanes to Spain and Spanish Morocco. Probably it was time, for there were queer stories about spares from Woolworth's. Anyway, the whole thing ended up with a queer state of affairs, in which an aeroplane, sold to a French buyer and ready to start for Le Bourget, with all its papers in order, was detained "on suspicion," though the whole transaction and the flight itself seemed to be thoroughly within the law.

The story that one small aeroplane, no doubt destined for work over the firing line if a Spanish purchaser could be found, had the legend "Buy me and stop one" painted on it, is not verified. Everyone became slightly hysterical over the whole business, and wild rumours circulated. One was about a mysterious foreign passenger who lost £20,000 bearer bonds on the way to Croydon. Scotland Yard were said to be enquiring. What actually seems to have happened is that a perfectly ordinary passenger arrived at one of the London air stations in a taxi and took the passenger coach to Croydon. On arrival he found he had left his brief case in the taxi. Naturally, Scotland Yard lost property department was notified and the thing was recovered the same evening. All it contained was business papers.

Capt. "Jimmy" Youell arrived one day with the Short Scion Senior for inspection by Imperial Airways, Ltd., and trial by some of the other pilots. It reminds one of a scaled-down Empire flying boat, except, of course, for the landing gear. Fitted with four Pobjoy Niagara engines and carrying nine passengers, it seems well adapted for smaller air routes, and it certainly gives an impression of comfort for passengers and efficiency in performance.

There was considerable activity amongst Press photographers and scribes last Wednesday, when H.H. the Maharaja of Mysore, wealthiest man in the British Empire, travelled from London to Amsterdam by K.L.M., and thence to Berlin by D.L.H. He and his suite, sixteen in all, together with a mysterious image said to be of fabulous price, occupied the whole machine—a Fokker F.20. Special food was ordered for the party, and the steward had implicit directions regarding its serving. The Dutch line seems to specialise somewhat in Indian notabilities, for quite recently passenger lists have recorded the name of H.H. the Maharaja of Jaipur, H.H. the Maharaja of Baroda, and Mr. Krishnamurti. The latter is, or was, looked upon by many as a kind of Messiah, and in the past was often seen at Croydon with the late Mrs. Annie Besant.

Homing Devices

There was a consignment of carrier pigeons from Budapest to Croydon by K.L.M. last week. On arrival they were released, and set off home again in a south-easterly direction. Recently there were hawks of the kind used in falconry imported by air to Croydon. If these occasions were combined and both hawks and pigeons released at the same time, we might see a spot of sport at our airport, which is dull enough, heaven knows, now the Spanish business is over.

A really sensible announcement has appeared in the French newspapers to the effect that Air France pilots with ten or more South Atlantic crossings to their credit, or who have flown over a million kilometres on regular air routes, will be granted an honorary first-class navigator's certificate. Logical as ever, the French say that if a man has practised the business and navigated in a first-class manner for ten years or so, he must be a first-class navigator. Our idea is to penalise thoroughly practical men by

waiting until they are too old to refurbish the necessary schoolboy mathematics (which youngsters can manage without trouble) and then springing an examination on them which is not even straightforward, but full of cunning examiner's pitfalls. There are people with every possible qualification as practical pilots who can be trusted to take any machine anywhere in any weather, but who will probably never pass "the navigator's" because they are not sufficiently mathematically minded. On the other hand, what shall it profit a company if one of these young prides of St. Adastral's Academy loses his head in a snowstorm one day and, despite the differential calculus, puts an airliner through the east window of Salisbury Cathedral when attempting to land at Gatwick (an airport where it is said never to snow or get foggy)?

Seventeen Years On

Last Tuesday was the seventeenth anniversary of the start of the first regular airlines between London (Hounslow) and Paris. Capt. "Bill" Lawford, genial, and now grey-haired, control tower officer at Croydon, took the first machine from England, and did the trip to schedule, carrying passengers, newspapers, several brace of grouse and some Devonshire cream. Capt. "Jerry" Shaw, now a petrol magnate with Asiatic Petroleum Co. (who, by the way, was seen piloting the Shell-Mex machine last Saturday at Croydon), made the trip from Paris to Hounslow the same day as Bill Lawford, seventeen years ago. M. Bouderie, Air France manager, Capt. Leverton of K.L.M., Mr. Dennis Handover and Mr. Robert Brenard are among some of the people one remembers from those days who are still going strong in the aviation business.

In view of the fact that it was in the columns of *Flight* that the whole Railway Clearing House position in regard to certain British air companies was fully exposed, and that it was mentioned that the only remedy was a strong protest by the Government, it is interesting to note that this has now been done. Apparently the Air Ministry has written to the railway companies, who show signs of capitulation.

Last week-end Surrey Flying Services, according to "Colonel" Joe Chamberlain, had a record week for joy-riding, something like 500 short flights being made. Fine weather and the proximity of the big swimming pool opposite to the airport have much to do with the increased business.

In earlier days magicians flew under their own power, but the modern practitioner flies through the air with the greatest of ease by K.L.M. Douglas. Dante, at present delighting London audiences with a "magical revue," came in recently from Holland. It must be difficult to clear a magician through Customs. At the remark, "Anything to declare?" he may produce a rabbit from his hat, a pack of cards from either sleeve and hundreds of yards of paper streamers from the ear of the Customs official himself. Is it wise to search his bag, for example, in case of magic explosions, and could he turn an inquisitive Customs official into a guinea pig?

Mr. Ben Smith, American airline magnate, is over here with a Wright-Cyclone-powered Vultee six-seater—of exceptional cruising speed, according to Mr. Town, its Canadian pilot.

Thought for the week: Ornithologists, now the migratory season is here, will not only be alert for the Crested Grebe, but also for the Tufted Pou (see *Flight* of August 20th).

A. VIATOR.

Coming into Line

AFTER long delays it appears that the Air Ministry has at last come to a decision about the type of blind-landing system to be installed at Croydon. Standard Telephones and Cables, Ltd., are now at work on Lorenz equipment for the airport, and aircraft operators will be able to decide on the installations to choose for their aircraft instead of waiting for an ideal which may or may not materialise at some future date.

Two More Airports Near London

TWO new airports in the Home Counties are projected. First, it is understood that, by arrangement with the Southern Railway, nearly 1,000 acres have been purchased at Eynsford, Kent, and it seems that a Kentish Gatwick may well be the result. A railway station is to be built. The site is just over seven miles from the Dartford end of the Purfleet-Dartford road tunnel now being driven under the Thames.

Secondly, in Buckinghamshire, Slough Urban District Council is to ask the Ministry of Health to sanction a loan of £65,708 for the purchase of a site. The site, about 190 acres in extent, is at Langley, close to the Colnbrook By-pass and the London road.

The Ministry has inspected the site and is prepared to sanction it, and Slough Estates, Ltd., who own the trading estate at Slough, are giving the matter consideration with a view to making a fixed contribution for a number of years to alleviate the initial outlay.

The Scipio Accident

UNTIL official findings are received little more can be done than regretfully to place on record news of the accident to Imperial Airways' Short *Scipio* at Mirabella, Crete, last Saturday.

The boat sank while alighting, and two of the seven passengers were drowned. Of the five survivors, one was seriously injured and the rest slightly. The crew—Capt. A. S. Wilcockson (Commander), First Officer Long, W/O. Birkenshaw and Steward Hemming—were also injured.

The accident, apparently, occurred during a storm. According to a statement by Imperial Airways, the *Scipio*, which was flying from Alexandria to Brindisi, was sunk by rough seas when alighting at Mirabella in the normal course of its voyage.

Imperial Airways also stated that, contrary to some reports, no S O S was sent out by the boat before the crash occurred.

The Imperial Airways yacht *Imperia*, which is stationed in the Mediterranean, was anchored about half a mile away from the scene of the accident, and at once went to the rescue.

The Short *Scipio* class has four Jupiter engines and cruises at 105 m.p.h. with fifteen passengers and a crew of four. *Scipio's* sister ships were the *Sylvanus* (destroyed by fire while refuelling at Brindisi last November) and the *Satyrus*.

Tiff Over Tiree

THE Duke of Argyll does not admit the charge that his ban on a proposed air service to the Island of Tiree, off the west coast of Scotland, is "a revival of feudal times." That phrase has been used in connection with the Duke's prohibition of aircraft owned by Northern and Scottish Airways from landing on the island.

The Duke, who is sixty-four, has never owned a motor car, and prefers to travel by bicycle, but his chamberlain said he welcomes tourists on Tiree, and would actually prefer them to travel by air. The journey from Renfrew, which takes thirteen hours by rail and steamer, can be accomplished in an hour and a quarter by air.

"The reason for the airline ban," explained his chamberlain to a correspondent, "is that the Duke feels that this particular airline behaved in a high-handed manner. They tried to open business negotiations with him, and when they came to nothing they started to act on their own accord. That the Duke will not permit.

"A telegram was sent to them forbidding their machine to land. As a matter of fact, the Duke was already in touch with another British company arranging a service to Tiree. Negotiations are still pending. It may well be that very soon there will be an air service for holiday-makers who want to go to Tiree."

A director of Northern and Scottish Airways told our correspondent: "We have offered every assistance to the chamberlain to the Duke of Argyll, and have complied with all his requests. We have had to disappoint passengers we had booked and have been prohibited from landing in Tiree. We have the assurance of the estate they will enter into negotiations with us, but so far no steps have been taken by them to do so."

Commercial Aviation

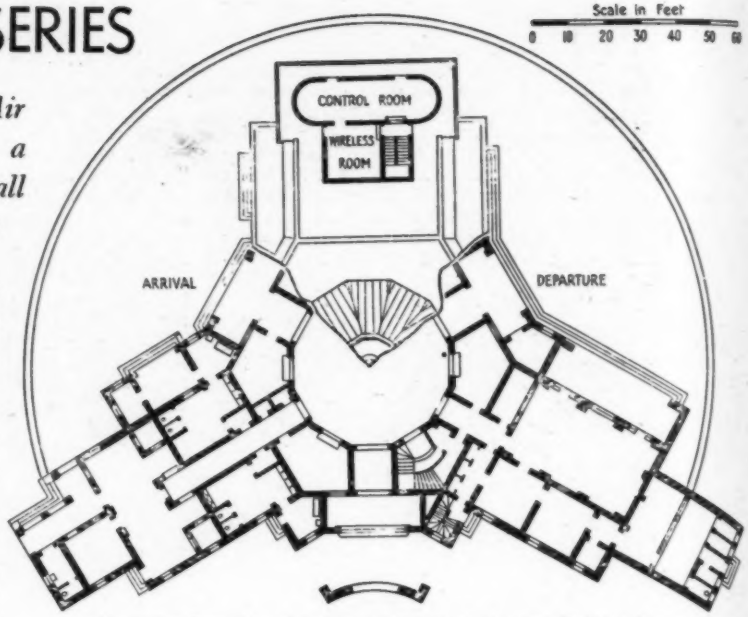
FIRST OF A SERIES

The New Willingdon Air Station: The Basis of a Design to be Adopted for all Indian Airport Buildings

OPENED recently, by His Excellency the Viceroy, the administrative building at New Delhi is of particular interest, since it is designed as the basis of a system which is to be adopted for all future buildings at the larger Indian airports. It is planned to form the centre of the Vee of the Duval system of aerodrome building layout, and an aerial view of the Willingdon Air Station, as it is named, was reproduced in *Flight* of April 2. On either wing are hangars and buildings for the operating companies, whilst at the rear, space is withheld for gardens and for the staff quarters.

The building itself has been designed round a central passenger hall in which there are offices available for booking companies. From the control tower there is a good all-round view, and a wireless room is in immediate communication, while offices are provided in the vicinity for the control and meteorological staff. In one wing are the cloakrooms and the Post Office sorting hall, and in the opposite wing is a restaurant. Provision has also been made for a police guard and a first-aid room.

The plans were drawn up by Mr. R. T. Russell, consulting architect to the Government of India, who was previously a member of a deputation sent by the Government of India to visit various aerodromes in Europe.



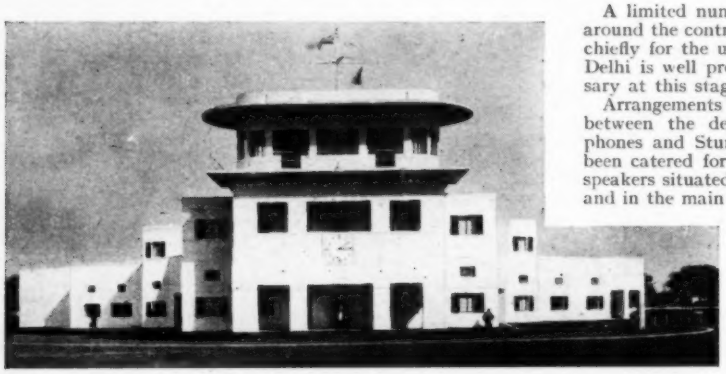
A ground-floor plan showing the layout of the new Delhi building.

The design of the building embodies many excellent features. Particular attention has been paid to the likelihood of future development, and extension is possible on both wings, so that traffic increases may be catered for in the future.

Bedrooms

A limited number of bedrooms have already been provided around the control hall on the first floor, but these are intended chiefly for the use of pilots who may be passing through. As Delhi is well provided with hotels, it is not considered necessary at this stage to arrange for passenger accommodation.

Arrangements have been made for internal communication between the departments concerned by electric bells, telephones and Sturtevant tubes. Loud-speaker control has also been catered for, with a microphone in the control tower and speakers situated on the exterior of the building on either wing and in the main hall.



Of pleasing and impressive appearance—the exterior of the Willingdon Air Station.

Yeadon on the Air

YEADON (Leeds-Bradford)—the third civil aerodrome in Yorkshire to be so equipped—will have its radio station operating within a few days.

The Air Ministry is paying the cost of the installation and about 90 per cent. of the maintenance charges.

Heavy Business at Renfrew

NORTHERN and Scottish Airways are considering a big extension of their service in view of the phenomenal increase of business in the past few months. During the Glasgow Fair holiday period particularly the rush of traffic was very heavy. Although no intending passengers were actually disappointed, every one of the fourteen available machines were pressed into service. It was obvious additional machines will be required for future development.

New routes are also under consideration, but the company cannot reveal their plans in this connection at present. An official of the company stated recently that negotiations were going on to place commercial aviation from Renfrew on a sound basis. "Our business from Renfrew shows a 50 per cent. increase this year," he said. "We have operated throughout the season without serious mishap, and although conditions have sometimes been all against flying, we have never failed to take off. The Isle of Man, Outer Hebrides, and the Campbeltown runs were the most popular routes during the Fair Week. At the height of the rush we carried 352 passengers in two and a half days."

R/t.—Indoor Variety

THE most up-to-date achievements of British manufacturers of radio for home use, as represented by the exhibits at Radiolympia, are fully described and illustrated in *The Wireless World* Complete Olympia Show Report, dated August 28. This special, enlarged number contains a detailed stand-to-stand report and the completeness of the survey makes the issue a very valuable work of reference for all wireless enthusiasts.

AN AIRLINE at LAW

Two Important Cases Involving Imperial Airways : Their Lesson for Air Transport Operators and Others

By a Barrister

TWO recent legal decisions are of considerable importance both to air transport operators and to those who travel by air, or who despatch goods by that medium. The cases in question are those of Westminster Bank, Ltd., *v.* Imperial Airways, Ltd., and Grein *v.* Imperial Airways, Ltd.

The former case arose out of the theft of some £21,000 worth of gold from a strong-room at Croydon Airport at about 4.30 a.m. in the morning of March 6 last, for which theft one Cecil Swanland is now undergoing a sentence of seven years' penal servitude. The gold was never recovered. The Westminster Bank's share of the gold lost was of the value of £2,138 13s. 6d., and for this sum Mr. Justice Lewes gave judgment against Imperial Airways on June 29.

In the latter case Frau Grein, on behalf of herself and her daughter, sued Imperial Airways for damages for the death of Herr Grein, the plaintiff's husband, which took place as a result of the crash of the defendant's aeroplane Apollo. The reader will remember that *Apollo* collided with a wireless mast at Ruysselede in Belgium, causing the death of its ten occupants, including the pilot, Gittins, on December 30, 1933. With that celerity which must be the envy of all airmen, the case reached the Court of Appeal on May 1 last, and on July 13 that court gave judgment by a majority, Lord Justice Greer dissenting in favour of the plaintiff for the sterling equivalent of 125,000 francs, namely £1,670. In the court below, Mr. Justice Lewes, the judge who also tried the Westminster Bank case, gave judgment for the plaintiff for £4,000. This judge had found, and the Court of Appeal unanimously agreed, that the death of Herr Grein was caused by the negligence of Gittins, the pilot, in not returning to the aerodrome at Haren, in Belgium, when he found himself in thick fog before the crash; for this negligence Imperial Airways were responsible.

The Warsaw Convention

Both cases were concerned with the interpretation of the Convention of Warsaw of 1929, which dealt with the unification of certain rules of international carriage by air, and has been made part of the law of this country by the Carriage by Air Act 1932. This Act has an English translation of the Convention in the first schedule, and the references below to the Articles of the Convention refer to the Articles in that translation.

Now the Convention only applies to international carriage between certain countries, for Article 1 says:

> "(1) This Convention applies to all international carriage of persons, luggage or goods.
>
> "(2) For the purposes of this Convention the expression 'international carriage' means any carriage in which, according to the contract made by the parties, *the place of departure* and *the place of destination* . . are situated either within the territories of two High Contracting Parties, or within the territory of a single High Contracting Party, if there *is an agreed stopping place* within a territory . of another Power, even though that Power is not a party to this Convention . . " (the italics are mine)

The hign contracting parties were the nations who signed the Convention or who afterwards acceded to it, among whom was, and is, the United Kingdom, but not Belgium.

In Grein's case the deceased had taken a return ticket from Croydon to Antwerp, via Brussels. The passenger had fifteen days in which to return from Antwerp, but if he did not return or did not return by the defendant's air line, he could get a refund of £2 8s. part of the £6 8s. which he had paid for the ticket. In these circumstances Mr. Justice Lewes and Lord Justice Greer thought that "the place of departure" within Article 1 (2) was London, i.e., Croydon, and the place of destination Antwerp. The majority of the Court of Appeal, namely Lord Justice Greene and Mr. Justice Talbot*, whose view prevails, held that London was both "the place of departure" and "the place of destination" with "an agreed stopping place" at Antwerp, within the second half of Article 1 (2) so that the Convention applied. As the Convention applied, Article 22 limited the liability of the defendant's in respect of Herr Grein's death to 125,000 francs, and as above stated the Court gave judgment for the equivalent of this sum.

The ticket which was issued to Herr Grein incorporated as part of the contract "the general conditions of carriage of passengers and baggage," which were in the form of the "International Air Traffic Association Agreement." If, therefore, the Convention did not apply, the "general conditions" did; but the "general conditions" which were "based on" the Convention also contained a limitation of liability of 125,000 francs, and the reader may well ask "what did it matter whether the Convention applied or not?"

Lord Campbell's Act

The answer is this. If the "general conditions" applied, they did so as part of the contract between Herr Grein and Imperial Airways. According to the Common Law of England no action lies arising out of a person's death. This rule was modified by an Act of Parliament called the Fatal Accidents Act 1846, and generally known as Lord Campbell's Act after its promoter, under which an action arising out of a person's death may, in certain circumstances, be brought for the benefit of or by, the deceased's wife, husband, parent or child, against the person responsible for the death. A case, Newman v. Southern Railway Company, decided that where the deceased had limited his right to a given sum of money, in that case £100, the limitation was not binding on a relative suing under Lord Campbell's Act. In consequence all the judges in Grein's case held, that if the Convention did not apply, contrary to the view of the Court of Appeal, the limitation in the "general conditions" did not bind Frau Grein, who would have been entitled to recover £4,000.

It is submitted with great respect to the majority of the Court of Appeal that the view of Lord Justice Greer and Mr. Justice Lewes is correct, and that a careful reading of the Convention will show that the expressions, "place of departure" and "place of destination" connote different places. Unless, however, Grein's case is appealed and the House of Lords accepts this view, the decision of the Court of Appeal remains and represents the law.

"Carriage by Air"

In the case of the Westminster Bank the gold was consigned to Paris, and as France signed the Convention the carriage was clearly international and no issue on this arose. The first issue which did arise was whether the "carriage by air" had begun. Imperial Airways had taken delivery of the gold at the plaintiff's branch at Lothbury, E.C. Article 18 provides:

> (1) The carrier is liable for damage sustained in the event of the . . . loss of . . . any goods, if the occurrence which caused the damage so sustained took place during the "carriage by air."
>
> (2) "The carriage by air within the meaning of the preceding paragraph comprises the period during which the . . goods are in charge of the carrier, whether in an aerodrome or on board an aircraft . . "

In view of sub-article (2) it was but "faintly" argued that the carriage by air had not begun when the gold was in the strong-room in Croydon Airport, and Lewes decided that it had begun.

The next question was more difficult. By Article 22 there is a limitation on the liability of the carrier of 250 francs per kilogram, which, of course, was far less than the value of the gold. This limitation was subject to certain conditions.

In the first place Article 22 itself provides for this limitation "unless the consignor has made, at the time when the package was handed over to the carrier, a special declaration of the value at delivery . . . " Now the value of the gold had been put in the Consignment Note, but in the space labelled "Special declaration of value at delivery" there was no declaration of value. Indeed there could not be, as the space was blacked

* This judge, who is not a member of the Court of Appeal, was sitting as an additional judge of that court.

out, and the evidence established that Imperial Airways would not accept a special declaration of value at delivery. In these circumstances Mr. Justice Lewes found that none had been made.

In the second place Article 5 provides that the carrier must make out and the consignor accept an "Air Consignment Note." Article 8 lays down a number of particulars which the Air Consignment Note must contain, of which sub-article (q) requires:

> "A statement that the carriage is subject to the rules relating to liability established by this Convention."

and Article I says:

> ". . . if the air consignment note does not contain all the particulars set out in Article 8 (a) to (i) inclusive and (q), the carrier shall not be entitled to avail himself of the provisions of this Convention, which exclude or limit his liability."

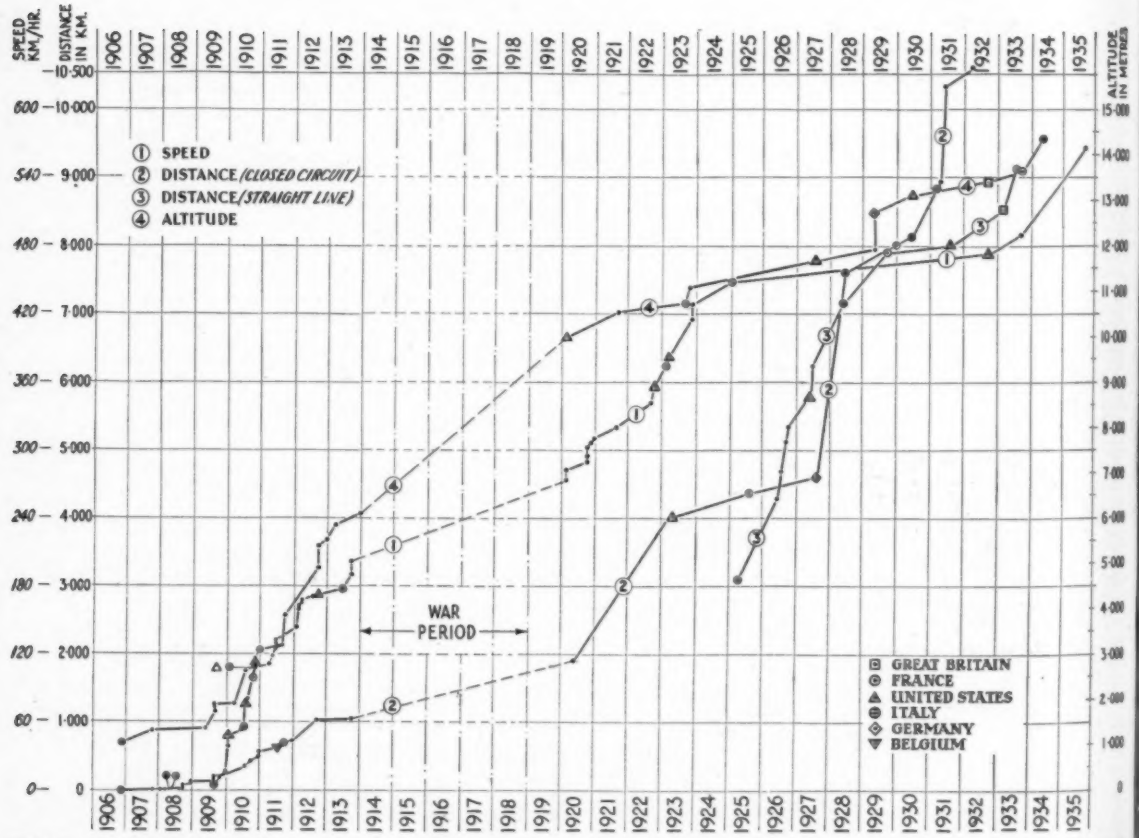
Imperial Airways' Consignment Note contained this reference to the Convention: "Carriage by Air: The general conditions of carriage of goods are applicable to both internal and international carriage. These general conditions are *based upon* the Convention of Warsaw . . ." (The italics are mine.) The "general conditions" were those referred to above in Grein's case, and were in the form of the International Air Traffic Association Agreement.

Mr. Justice Lewis held that a statement that the carriage was governed by general conditions which were "based upon" the Convention was not a statement that the carriage was "subject to the rules relating to liability established by this Convention" within the meaning of Article 8 (q), and, as Article 22 was a provision limiting the carrier's liability within the meaning of Article 9, it was, in the circumstances, inapplicable, and Imperial Airways were liable for the full value of the gold.

In view of these two decisions air transport undertakers may well think it advisable in the future to embody the Convention in their passenger and luggage tickets and air consignment notes rather than to attempt to improve upon the Convention in such contracts.

AIR RECORDS from the BEGINNING

An At-a-glance Chart : How Speed, Distance and Altitude Records Have Climbed from 1906 to the Present Day



THIS chart shows at a glance the progress of world air records of four categories. In the main it is self-explanatory. Where small plain dots occur on the curves they indicate that the records concerned were improvements on one previously held by the same country. It should be pointed out that for a number of years the record was credited to the country in which it was established, even if the pilot and aeroplane were of a different nationality. Speed has risen from 41.292 km. per hour (25.7 m.p.h.) to 567.115 km. per hour (352.4 m.p.h.). Distance in a straight line became recognised in 1925, the first record being of 3,166 km. (1,967 miles) and the present 9,104 km. (5,655 miles). In 1906 the record distance over a closed circuit was 220 metres (240 yards); it is now 10,601.480 km. (6,586 miles). From an altitude of 155 metres (509 ft.) in 1909 we reached 14,433 m. (47,353 ft.) in 1934. This record was increased the other day to 14,843 m. (48,698 ft.) by the French pilot Detre (see p. 220), but this record still has to be homologated. These records are all for aeroplanes. The world's speed record for seaplanes stands at 709.209 km. per hour. (440.67 m.p.h.).

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THE CONSTANT-SPEED AIRSCREW

An Explanation of the Principle of the Hamilton Standard: Advantages to be expected

DURING the last year or two references have frequently appeared to the new constant-speed airscrew developed by Hamilton Standard Propellers, a division of United Aircraft Corporation of East Hartford, Connecticut, U.S.A., but so far it has not been possible to publish a description of the principle upon which the constant-speed airscrew works. The restrictions which prevented publication of a description have now been removed, and the principle is explained in the following article. Readers of *Flight* will scarcely need to be reminded that the De Havilland Aircraft Co., Ltd., holds the licence to build Hamilton Standard variable-pitch airscrews in this country, and it is to be expected that the D.H. constant-speed v.p. airscrew will soon be seen on a number of British aircraft.—ED.

As is well known, the primary function of any constant-speed airscrew is to permit the engine to run at desired r.p.m. regardless of altitude or forward speed of the aeroplane. This is important for engine operation, since power depends on both the r.p.m. and the throttle opening. The constant-speed airscrew makes possible the control of engine speed independent of the throttle. From one standpoint it acts as a governor, holding r.p.m. constant, no matter whether climbing, diving or flying level. From another standpoint it acts as a controllable load, permitting the engine to develop as much of its full rated power as the pilot wishes.

This is accomplished by automatic change of airscrew pitch. In the Hamilton Standard design the pitch is shifted by oil pressure, the airscrew itself being basically the same as the Hamilton Standard two-position controllable. Counterweights acted on by centrifugal force provide the operating force to move the blades toward high pitch, and the oil pressure works in the opposite direction against the counterweights, setting the pitch to any intermediate position between full low and full high.

Pitch is automatically selected by a separate unit called the constant-speed control, which regulates the oil pressure in the airscrew-operating cylinder. A simple gear pump in this unit boosts the engine oil pressure up to 180-200 lb. per square inch, where it is maintained by means of a relief valve. Although considerably less pressure is

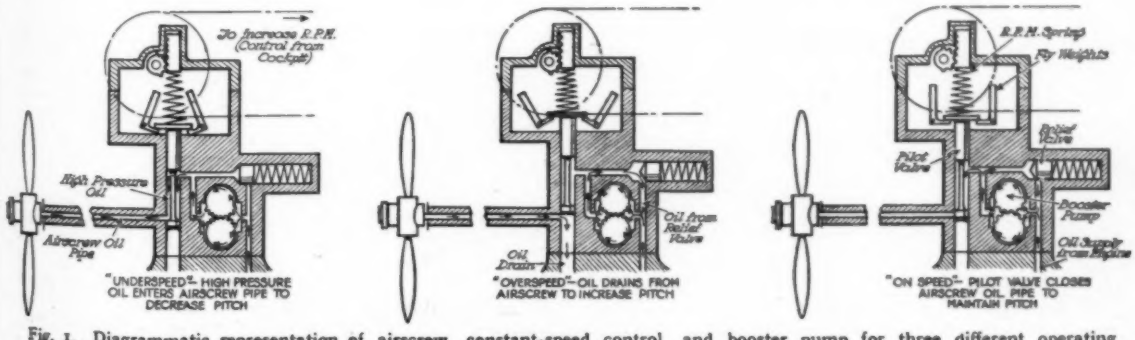

To Increase R.P.M. (Control from Cockpit)
High Pressure Oil
Airscrew Oil Pipe
"UNDERSPEED"—HIGH PRESSURE OIL ENTERS AIRSCREW PIPE TO DECREASE PITCH
Oil Drain
Oil from Relief Valve
"OVERSPEED"—OIL DRAINS FROM AIRSCREW TO INCREASE PITCH
R.P.M. Springs & Weights
Relief Valve
Pilot Valve
Booster Pump
Oil Supply from Engine
"ON SPEED"—PILOT VALVE CLOSES AIRSCREW OIL PIPE TO MAINTAIN PITCH

Fig. 1. Diagrammatic representation of airscrew, constant-speed control, and booster pump for three different operating conditions.

normally required to shift pitch, this comparatively high value is desirable to give responsive pitch-changing action when called for by the constant-speed control. It provides better governing and eliminates over-revving and under-revving, which might result from sluggish action.

The sketches (Fig. 1) indicate airscrew, constant-speed control, and booster pump in their associated relation for three different operating conditions. The first, "Underspeed," is the case where r.p.m. is less than that desired, such as occurs momentarily when the aeroplane is pulled up into a climb, or when the throttle is moved to a partially closed position. The second, "Overspeed," is the case where r.p.m. is more than that desired, such as occurs momentarily when the machine is nosed down into a dive, or when the throttle is opened rapidly. In the third case, "On Speed," the r.p.m. is exactly the amount for which the control is set, and there is no need to increase or decrease the airscrew pitch.

In the speed-control a pilot valve moves up and down in a cylinder in response to the action of fly weights working against the tension of a spring, referred to as the "r.p.m. Spring." The fly weights are driven by the engine in proportion to engine speed; the tension of the spring is controlled by the pilot. Obviously, the greater this spring tension is the faster the fly weights must rotate before they can compress the spring upward. When they are not rotating fast enough to accomplish this the spring forces the pilot valve downward so that it uncovers the port leading to the airscrew feed pipe as shown in the "Underspeed" sketch. This allows oil under pressure from the booster pump to flow to the airscrew, decreasing its pitch. When the fly weights are rotating faster than the speed for which the spring tension is set they compress the spring, carrying the pilot valve upward, opening the airscrew port and allowing the oil in the airscrew cylinder to drain back to the engine. This shifts the airscrew toward high pitch, as shown in the "Overspeed" sketch. The "On Speed" condition results when the rotation of the fly weights is just sufficient to balance the spring tension and hold the pilot valve so that it closes the airscrew port. Under these conditions the pitch remains constant. This is the stabilised condition in which the pitch is exactly right to give the desired r.p.m.

The Oil Pressure System

The booster pump is a simple gear type driven by the engine. Oil from the engine pressure system feeds into it and is boosted to higher pressure. This high-pressure oil fills the space between the necked-down section of the pilot valve and the walls of the cylinder, and backs up against the spring-loaded relief valve. When the pressure builds up to about 180 lb./sq. in. the relief valve opens, allowing some of the oil to circulate around the pump and come back into it again on the low-pressure side, the same oil being used over and over without drawing on the engine lubricating supply. Only when the pilot valve moves downward, as shown in the "Underspeed" sketch, does any of the oil flow out to the airscrew, and in this case only is there a demand for more oil from the engine supply. At all other times, "Overspeed" and "On Speed," the relief valve stays open, relieving enough of the pressure to maintain 180-200 lb./sq. in. available.

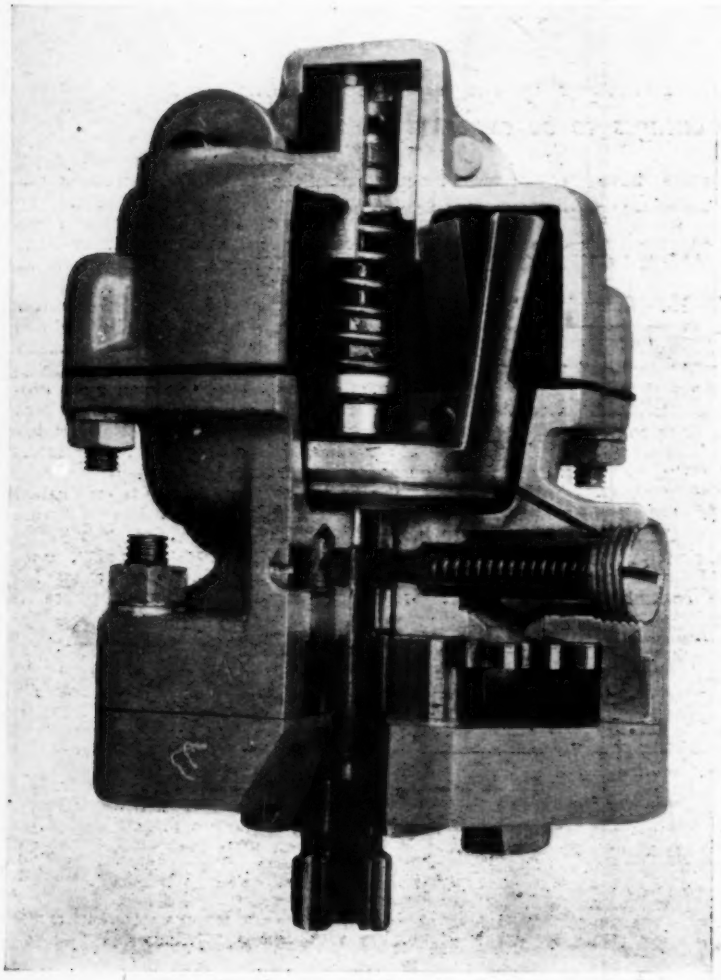


Fig. 2. Cut-away demonstration model of constant-speed control unit.

Figs. 2 and 3 are photographs of actual cut-away units. Fig. 2 is the standard constant-speed control, and Fig. 3 shows it mounted on the nose section of an engine with the airscrew installed on the engine shaft. This gives a clear idea of the oil passage loading from the engine pressure supply to the booster pump and of the feeder pipe from the pilot valve to the airscrew. In the feeder pipe the oil flows in both directions, to the airscrew when decreasing pitch and from the airscrew when increasing it.

Fig. 3 (next page) shows the method of transferring oil from the feeder pipe into the rotating engine shaft, thence to the airscrew. A set of rings, called "transfer rings," ride in annular grooves around the shaft and in the engine case, allowing oil from the feeder pipe to flow into the hollow shaft, and vice versa, and at the same time sealing it from leaking out into the engine. In Fig. 1 these transfer rings are not indicated, but all principal parts are included, and it is easy to visualise what goes on in the actual unit by cross reference to the schematic sketches.

All Hamilton Standard controllables can be converted readily into constant-speed airscrews by the installation of a constant-speed control on the engine and by conversion of the airscrew to greater pitch range if necessary. In some cases other minor parts have to be changed, but in every instance the conversion can be accomplished as a field modification.

Operating characteristics of constant-speed airscrews require a departure from the conventional method of manual mixture adjustment. Any increase or decrease of power obtained by adjusting the carburetter fuel/air ratio is accompanied by a change of airscrew pitch, such that the r.p.m. is not affected. Tachometer indications, therefore, cannot be depended on as with fixed-pitch airscrews, and instead it is customary to use automatic mixture controls or fuel-air ratio indicators, such as exhaust-gas analysers and fuel-flow meters.

Provision is made so that the pilot can discontinue the governing action whenever desired and shift the airscrew into full high pitch, but except for checking the pitch-changing action or the engine operation there is no point in discontinuing the governing action with power on. However, positive high pitch does have one very important use, namely, in case of engine failure on a multi-engined aeroplane, wherein the performance of the plane with one engine out can be materially improved by shifting the dead engine's airscrew to full high pitch where its windmilling drag is much less than in low pitch. Without this feature the dead engine's airscrew would automatically be shifted to full low pitch by the constant-speed control trying to maintain r.p.m.

The benefits derived from constant-speed airscrews are most apparent in the case of high-performance aeroplanes, especially when equipped with supercharged engines. For high speed, especially when reduction gearing is employed, comparatively high pitch settings are required. On the other hand, low pitch settings are required during take-off. Therefore the range between low and high pitch is large for high-performance planes, and it becomes increasingly difficult for the two-position controllable airscrew to provide satisfactory performance at all times.

Advantages of C.-S. Airscrews

To illustrate the advantages provided by a constant-speed airscrew the accompanying curves, Fig. 4, show the thrust horse-power available in level flight at cruising manifold pressure with a fixed-pitch airscrew, a two-position controllable airscrew, and a constant-speed airscrew. The curves have been plotted from actual calculations based on a representative high-performance aeroplane and engine.

The lowest of the three curves shows the thrust horse-power available with a fixed-pitch airscrew set to give cruising-engine r.p.m. at 17,100ft. altitude with full throttle in level flight. It would, of course, be difficult, if not impossible, for the aeroplane to take off with a fixed-pitch airscrew under these conditions, and therefore a two-position controllable would probably be necessary, in which case this curve would apply to the controllable in high pitch set for 17,100ft. altitude. The low pitch would be set to permit satisfactory take-off and climb at low altitude. This curve shows that with the airscrew in high pitch only slightly more than 300 thrust horse-power is available at sea level, and the maximum cruising horse-power cannot be utilised until an altitude of 17,100ft. is reached. The intermediate curve, Fig. 4, shows the thrust horse-power available with a fixed-pitch airscrew adjusted to give cruising r.p.m. at 10,000ft. altitude with cruising manifold pressure in level flight. Under these conditions considerably more power is available at sea level than in the case of the airscrew adjusted for 17,100ft. altitude, and therefore it would probably be possible to take off with a fixed pitch. However, a two-position controllable, with the high pitch adjusted to 10,000ft. and the low pitch for take-off and climb, would be preferable. Whereas the two-position controllable would make possible better aeroplane performance from sea level to 10,000ft., it would be no different from the fixed-pitch airscrew above 10,000ft.

The third of these curves indicates the thrust horse-power available with a constant-speed airscrew installed on the same plane and engine. This shows that the maximum allowable cruising power can be utilised at all altitudes from sea level up to 17,100ft. With the constant-speed airscrew 18.6 per cent. more power is available at sea level than with the airscrew set for 10,000ft., i.e., a fixed-pitch airscrew or a two-position controllable airscrew in high pitch. Likewise, with the constant-speed airscrew, 24.4 per cent. more power is available at sea level than with the airscrew set for 17,100ft. altitude, i.e., the high-pitch setting of a two-position controllable airscrew. It is obvious that at 17,100ft. (critical engine altitude for cruising power) the constant-speed airscrew cannot make available more power than the high-pitch setting of the two-position controllable airscrew, but as compared with the fixed-pitch airscrew set for 10,000ft. (or the high pitch of a two-position controllable airscrew set for 10,000ft.) there is 43.5 per cent. more power.

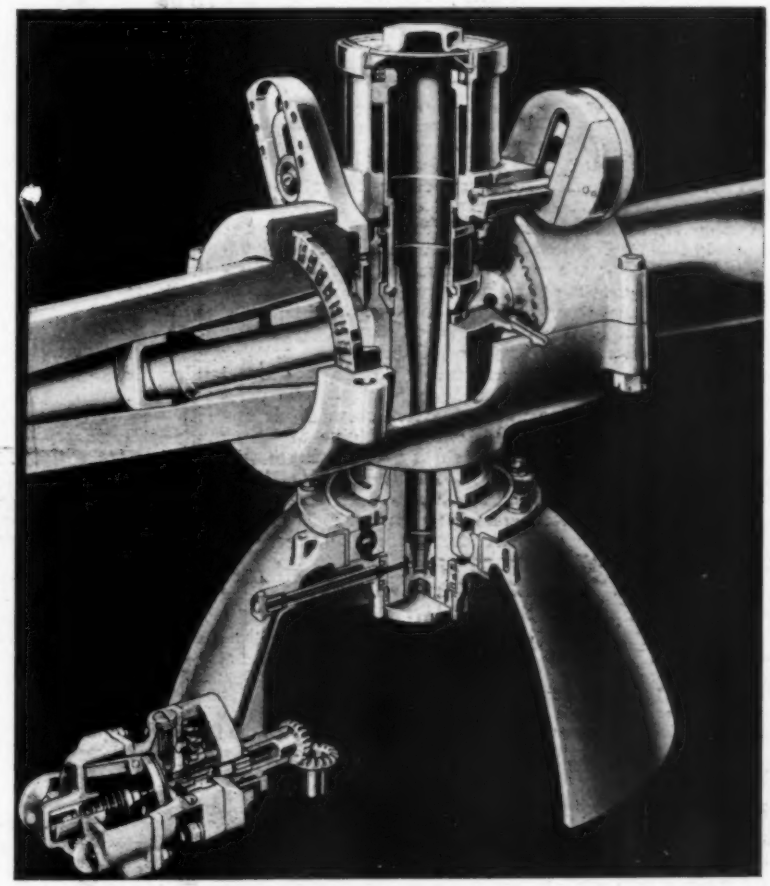


Fig. 3. Cut-away demonstration model of airscrew, showing control unit and its oil passage.

For take-off the pilot may utilise all of the power which the engine manufacturer allows for safe operation of the engine. This is accomplished by opening the throttle to give the maximum permissible manifold pressure at the blocks and adjusting the constant-speed control to give full take-off r.p.m. The constant-speed airscrew will hold this r.p.m. constant irrespective of the change in the forward speed of the aeroplane as it increases from zero at the start of the take-off to flying speed. Therefore, with manifold pressure and r.p.m. unchanged, this full power is utilised throughout the take-off run and into the climb.

While climbing to cruising altitude the full rated power of the engine is available at all flying speeds and all

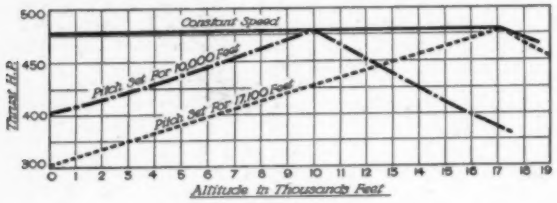

Constant Speed
Pitch Set For 10,000 Feet
Pitch Set For 17,000 Feet
Thrust H.P.
500
450
400
300
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Altitude in Thousands Feet

Fig. 4. Comparison of power available in level flight with fixed-pitch, two-pitch, and constant-speed airscrews at cruising manifold pressures. The curves relate to an engine of 750 b.h.p. at 10,000 and 1,667 r.p.m. airscrew speed; an aeroplane with a speed of 250 m.p.h. at 10,000 ft.; and three-bladed airscrews of 10 ft diameter. The cruising limits of engine operation are 563 b.h.p. and 1,513 r.p.m.

altitudes by independent control of the manifold pressure (throttle) and the r.p.m. (constant-speed control). With supercharged engines there is a decided increase in the rate of climb to cruising altitude compared with the corresponding performance using a fixed-pitch airscrew or a two-position controllable.

When cruising altitude is reached and the pilot wishes to reduce the power to that desired for cruising it is simply necessary to set the constant-speed control to the corresponding r.p.m. and adjust the throttle to the cruising manifold pressure. A change in altitude, of course, necessitates readjusting the throttle to correct for the corresponding change of manifold pressure, but the r.p.m. will remain unchanged, being automatically taken care of by the constant-speed control.

Cruising speed and top speed are both improved markedly above and below critical altitude for cruising compared with the performance when using a fixed-pitch or two-position controllable airscrew. At critical altitude the constant-speed airscrew would, of course, give the same performance as either a fixed-pitch or a two-position controllable airscrew adjusted for that altitude, but, above, the improvement in cruising speed and top speed would again appear with the constant-speed airscrew.

In military aeroplanes the constant-speed airscrew is of value in making full engine power available to the pilot under all conditions of fighting manœuvres, eliminating the harmful effects of engine overspeeding attendant on diving. In formation flying the speed of each aeroplane is controlled by throttle in conventional manner, but this change of power is not accomplished by a corresponding change of r.p.m., since the r.p.m. is held constant and only the manifold pressure is changed. The constant-speed airscrew makes it possible to go through various manœuvres in acrobatic flying without the necessity of readjusting the throttle to prevent engine overspeeding.

On multi-engined aeroplanes the degree to which the r.p.m. of the engines can be held constant is more exacting than in the case of single-engined planes, since any slight variation becomes at once apparent by the engines falling out of synchronism. The ability of constant-speed airscrews to maintain synchronism is extremely good, and this indicates the high degree to which these airscrews govern engine speed. Numerous constant-speed installations on multi-engined planes, including two-engined, three-engined, and four-engined planes, demonstrate this fact conclusively.

The most extraordinary condition to which the action of the constant-speed airscrews can be subjected is the sudden change in pitch required to accommodate a "burst" of throttle on one engine with the remaining engines running steadily in flight. Under these conditions the constant-speed airscrew responds so quickly that no more than one or two seconds are required to return the engine speed back to synchronism with the other engines. Only a momentary reduction of engine speed occurs when suddenly "cutting" one throttle on a multi-engined plane in flight. The responsiveness of the constant-speed airscrews makes it practically impossible to detect any variation in synchronism of the engines that might be caused by suddenly climbing, diving, or going into a sharp turn. Also, multi-engined machines equipped with constant-speed airscrews are remarkably free from being thrown out of synchronism by rough air. Consequently, when once synchronised, the throttles can be readjusted as desired without affecting synchronism. For instance, when climbing or descending, the throttles can be changed to correct for altitude without the necessity of having to re-synchronise.

In multi-engined machines used in long-distance flying appreciable fuel saving can be derived from the use of constant-speed airscrews in view of the fact that they permit the engines to be operated under the most economical conditions during the climb and the descent from cruising altitude as well as while cruising at the various altitudes that may be selected. In descending from cruising altitude it is possible to increase the airspeed of the plane considerably without change of engine r.p.m. or power.

Some extremely interesting experiments have been conducted recently in combination with automatic mixture controls which maintain pressure below the carburetter constant. It has been shown that considerable economy of fuel consumption results from governing the power by means of the constant-speed control, leaving the throttle wide open.

V.P. MAINTENANCE

A SIGN of the times is provided by the issue this week by the De Havilland Aircraft Co., Ltd., of a Service Manual on the care and maintenance of De Havilland variable-pitch airscrews. Profusely illustrated by photographs, sketches and diagrams, the manual is divided into eleven chapters, and an introduction explains the advantages to be expected from the fitting of variable-pitch airscrews in different types of aircraft.

The first chapter is devoted to a description of the component parts of the De Havilland V.P. airscrew, numbers in the text and on the illustrations assisting in rapid identification of the somewhat complex assemblies. The next chapter describes in detail the operating mechanism, and chapter three deals with the importance of the installation of the airscrew in the aircraft.

Instructions for running the airscrew on the ground and in the air are given in chapter four, which points out that after a flight the airscrew should be left in the high pitch position, as this will facilitate routine inspection and adjustment.

Possible causes of failure to change pitch, including various reasons that may be responsible for sluggishness in the changing of pitch, are dealt with next, and then follow chapters on carrying out complete overhauls, on inspection of parts, and on reassembly after overhaul.

The delicate operation of balancing is given a chapter to itself, and discloses certain alterations in construction as compared with the original American airscrew. Daily maintenance is dealt with next, and maintenance after every ten hours and after the first hundred hours. The concluding chapter describes and illustrates the special tool kit, and gives a list of clearances and tolerances. A copy of this booklet can be obtained from the Airscrew Division at Stag Lane, price 5s. net.

TAPERED WING GEOMETRY

By H. PARKINSON

THE more general form of tapered wing is of the straight tapered form shown in Fig. 5; and the popular method of obtaining the rib ordinates, between the predetermined basic aerofoil section, is by means of an accurate layout usually termed an "Ordinagraph." As this particular method of solving the rib profiles has been previously described in these pages, it is not proposed to discuss the construction of this in the present article.

Solution of the intermediate rib profiles is obtainable either by calculation, draughtsmanship, or a combination of the two methods.

The first method is particularly accurate but is hardly warranted when one considers the amount of labour involved, together with application of the results to manufacture of the component parts. This statement is made in a general way, as it is realised that choice of methods is a matter of individual experience and taste.

The "Ordinagraph" is essentially a practical solution which is easy to handle, and produces results in keeping with the requirements. It is, however, very sensitive to drawing accuracy, and the magnitude of errors tends to increase as the wing size becomes larger. In addition to this it is necessary to construct a separate layout for each particular wing under consideration.

These criticisms are not intended to convey that the present solution is superior to the previous methods, but rather to qualify certain adverse features which are not inherent with the following example.

First choose the particular aerofoil section to be analysed and decide upon the maximum and minimum cambers that are likely to be handled. In this case NACA sections 2409 to 2421 have been chosen. The ordinates, on a percentage chord basis, are given in Tables 1 and 2, and the values are represented in graph form on Figures 1 to 4 inclusive. It will be appreciated that these graphs should be plotted to a reasonably large scale, and as they are constructed on a percentage basis they may take the form of standard data sheets.

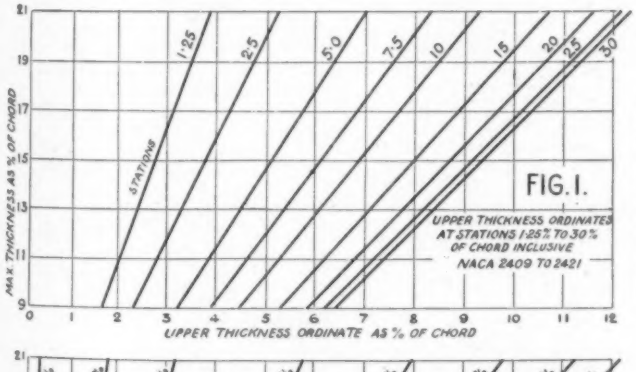
It will be seen from Figure 5 that the chord and maxi-

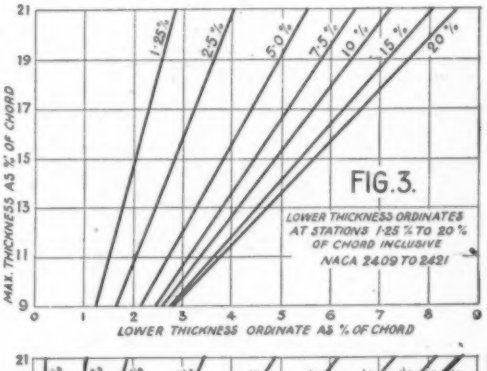
TABLE 1.
NACA. 2409
Figures quoted as % of Chord.

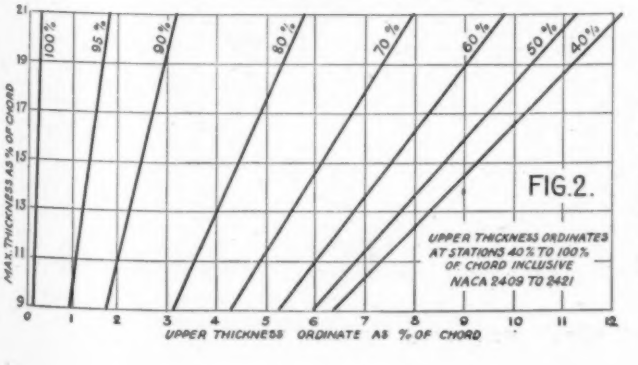
Distance from L.E.	Upper Ordinate.	Lower Ordinate.
0	—	—
1.25	1.62	1.23
2.5	2.27	1.66
5.0	3.20	2.15
7.5	3.87	2.44
10	4.43	2.60
15	5.25	2.77
20	5.81	2.79
25	6.18	2.74
30	6.38	2.62
40	6.35	2.35
50	5.92	2.02
60	5.22	1.63
70	4.27	1.24
80	3.10	0.85
90	1.72	0.47
95	0.94	0.28
100	0.10	0.10

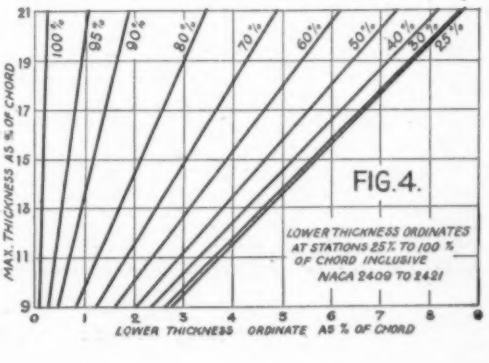
TABLE 2.
NACA. 2421
Figures quoted as % of Chord.

Distance from L.E.	Upper Ordinate.	Lower Ordinate.
0	—	—
1.25	3.87	2.82
2.5	5.21	4.02
5.0	7.00	5.51
7.5	8.29	6.48
10	9.28	7.18
15	10.70	8.05
20	11.59	8.52
25	12.15	8.67
30	12.38	8.62
40	12.16	8.16
50	11.22	7.31
60	9.79	6.17
70	7.94	4.87
80	5.74	3.44
90	3.18	1.88
95	1.76	1.06
100	0.22	0.22









muin thickness of a section at distance S_1 from the root datum is given by :—

$$C_1 = C - \left(\frac{S_1 (C - C_2)}{S}\right)$$

and

$$T_1 = T - \left(\frac{S_1 (T - T_2)}{S}\right)$$

where C_1 and T_1 are the maximum chord and thickness respectively at any predetermined distance S_1 from the root.

The maximum thickness as a percentage of the chord can now be obtained, and the required ordinates follow from the graphs.

Design of the wing tip is a matter of special consideration for individual designs, irrespective of the particular method chosen for solving the rib ordinates. Should the contour follow a definite mathematical law it will be convenient to calculate the chords and thicknesses. In other cases it will be necessary to estimate them by drawing.

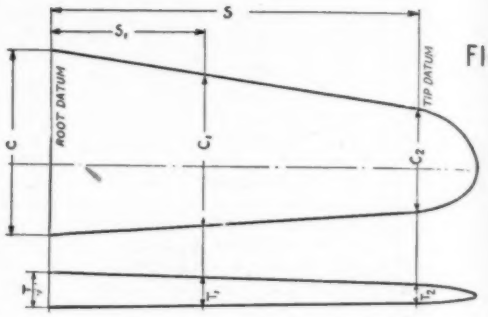


FIG. 5.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

REPORTS published by His Majesty's Stationery Office, London, which may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester, 1; St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any ordinary bookseller.

EXPERIMENTS ON A SMALL-CHORD FLAP ON A CLARK YH AEROFOIL IN THE COMPRESSED AIR TUNNEL. By D. H. Williams, B.Sc., and A. F. Brown, B.Sc., of the Aerodynamics Department, N.P.L. R. & M. No. 1681. (14 pages and 8 diagrams.) May 24, 1935. Price 1s. net.

The experiments were conducted to determine the scale effect on a flap, of 1/20th chord width, inclined at different angles to the main part of an aerofoil of Clark YH section.

Flap angles were varied from 0 to 25° at values of Reynolds number of 0.3, 0.8, 2 and 4 millions approximately.

The rate of increase of lift with flap angle diminishes as the flap angle increases. The increase in lift due to flap angle increases with increasing Reynolds number, rapidly between R = 0.3 and 0.8 millions and then more gradually up to a value of R somewhat higher than the highest used in the experiments.

NOTE ON THE COOLING OF AIRCRAFT ENGINES WITH SPECIAL REFERENCE TO ETHYLENE GLYCOL RADIATORS ENCLOSED IN DUCTS. By F. W. Meredith, B.A. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1683. (13 pages.) August 14, 1935. Price 9d. net.

Cooling of aero engines involves the exposure of a large heated surface to a stream of air, a process which involves the expenditure of power owing to the viscosity of air. Until recently, it appeared that this fact imposed an intractable limit to the speed of aircraft since, whereas the heat transfer only varies directly as the speed of the air over the surface, the power expenditure varies as the cube. Thus even though the exposed surface be adjusted until only the required heat transfer is effected, the power expenditure increases as the square of the speed. This fact and the recent increase in the speed of aeroplanes has brought the question of cooling drag into prominence and forced the application of the principle of low velocity cooling. An analysis of the performance of a cooling system enclosed in a duct was therefore required to guide further research and design.

The theory of the ducted radiator is here developed, and a basis of calculating the drag is provided. The effects of compressibility are also investigated.

This report demonstrates that the power expended on cooling does not increase with speed for a properly designed ducted system, but that, owing to recovery of waste heat, a thrust may be derived at speeds of the order of 300 m.p.h. Attention is also drawn to the importance of the momentum of the exhaust gases at high speeds of flight.

THE TWO-DIMENSIONAL FLOW OF COMPRESSIBLE FLUIDS AT SUBSONIC SPEEDS PAST ELLIPTIC CYLINDERS. By S. G. Hooker, A.R.C.Sc., D.Phil., Senior Student for the Exhibition of 1851. Communicated by Professor R. V. Southwell, F.R.S. R. & M. No. 1684. (16 pages and 5 diagrams.) November 5, 1935. Price 1s. net.

When a body moves through a compressible, inviscid fluid at a speed which is small compared with that of sound, so that the local velocity of sound is never exceeded by the fluid at any point in the field, the effect of compressibility is merely to distort slightly the streamlines from the positions they would have occupied if the fluid had been incompressible. The determination of the magnitude of this distortion, and its effect upon the velocity field, involves considerable difficulty, and has so far been calculated approximately by Janzen, and Rayleigh, only for the flow past circular cylinders and spheres. It has been presumed in the past that this method gives a correct estimation provided that the local velocity of sound is not exceeded at any point in the field.

Only the case of the fluid streaming past the cylinders in the direction of their major axes is considered; and owing to the necessity for expanding a certain function in the analysis, the fineness ratio of the ellipse to which the theory can be applied is limited.

Since actual experimental data for elliptic cylinders is lacking, the measurements made by the late Sir Thomas Stanton for the front portion of a symmetrical Joukowski aerofoil are used to check the theoretical conclusions. An ellipse of fineness ratio 4.45 : 1 fits the leading part of the aerofoil quite closely, and the calculated effects of air compression upon the minimum pressure are in good agreement with those observed up to $U/a_0 = 0.50$. For higher speeds the observed effect is much greater than that predicted by theory, and it is shown that the divergence between the two does not correspond with the attainment of the local speed of sound by the air on the aerofoil's surface.

THE EFFECT OF VARIATION OF AILERON INERTIA AND DAMPING ON THE FLEXURAL-AILERON FLUTTER OF A TYPICAL CANTILEVER WING. By V. M. Falkner, B.Sc., A.M.I.Mech.E., of the Aerodynamics Department, N.P.L. R. & M. No. 1685. (12 pages.) October 17, 1935. Price 1s. net.

The present work forms part of an investigation on methods of flutter prevention, deals with a "dead-centre" aileron control on a flexible model Puss Moth wing and relates to the use of mechanical devices for increasing artificially the aileron damping and moment of inertia.

Calculations have been made of the critical flexural-aileron flutter speeds of a cantilever wing, with a reversible aileron control of the usual type, of which the characteristics have been chosen to represent, as far as information is available, current practice as applied to a high speed aircraft. The critical speeds have been calculated for a range of values of the product of inertia, the aileron inertia, and the aileron damping coefficient.

The use of a device which increases artificially the moment of inertia of the aileron, may lead to dangerous flutter conditions, whether used with or without mass balancing of the aileron. On the other hand, the artificial increase of the aileron damping is considered to be very promising as an aid to the suppression of flexural-aileron flutter.

AIR AND VAPOUR LOCKS IN FUEL SYSTEMS. By M. A. A. Allfrey, B.A., of the Royal Aircraft Establishment. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1693. (14 pages and 10 diagrams.) January 31, 1936. Price 1s. 3d. net.

Failures of aircraft engines have often been attributed to fuel starvation brought about by air or vapour in the fuel system and it was required to find out in what circumstances such failures could occur, and what should be done to prevent their occurrence.

Air locking was studied in the laboratory by observing the behaviour of a fuel-air system in glass pipes; this led to diagnosis of an air lock as the cause of failure in an aeroplane, and the investigation was continued on this aircraft to find the source and to measure the rate of accumulation of the "locking" air. As vapour locking is a trouble which has not yet been experienced at the Royal Aircraft Establishment, it was studied only by reference to published information.

Apart from air introduced into the system in bulk, as in aerobatics, the amount of air in the fuel that can come out of solution when flying at height is ample to cause locking in a system prone to that trouble. A gravity fuel system can be air locked if it is possible for a large proportion of the head-giving pipe-line to remain full of air over a range of petrol flows, stoppage being due to loss of the amount of head which would otherwise be given by the sections of pipe occupied by the entrapped air. Prevention lies in suitable lay-out of the upper part of the system coupled with use of the appropriate bore of pipe. One limb of a parallel flow gravity system may become locked with the result that the tanks empty unevenly, but this does not cause engine failure. Pump systems which prime themselves cannot be air locked, but they will cease to function if the cock to an emptied tank below the pump is left open.

Interference with fuel flow brought about by the continued vaporisation of the petrol may occur at the carburetter jet or at the suction side of the pump, its onset at a given height being governed by the fuel temperature. The vapour locking temperature is high near the ground, but at great heights this temperature is lower and there appears to be likelihood of trouble. The cure lies in reducing the temperature of the petrol and in limiting the suction lift of the pump. At extreme heights it would be advantageous as regards vapour locking to place the carburetter on the pressure side of the supercharger.

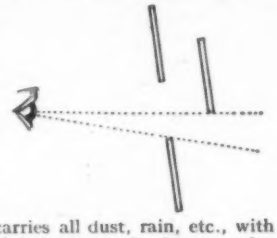
CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases, accompany letters intended for publication in these columns

WINDSCREENS

IN your issue of July 30, under "Private Flying," your contributor "Indicator" discussed the feasibility of the rotating disc type of windscreen for transport machines, raising the point concerning their weight.

Has the split or two-layer type of screen as used, I believe, by Capt. Eyston on his record-breaking saloon car been tried by any manufacturer, and if so, in what direction was it found wanting?



The screen to which I refer, and with which you are no doubt familiar, consists of a portion embodying a horizontal gap of several inches partly covered by a separate sheet of glass mounted forward of the main screen. A draught is induced between the two layers of glass, which carries all dust, rain, etc., with it. Vision is through a space left between the bottom edge of the main gap and the bottom edge of the outer sheet of glass, i.e., not through glass at all; hence it is non-fogging under all conditions.

The possibiiity of designing the screen to be effective over a wide speed range would appear to be the most important point.

A. E. TUPPEN.

Rugby.

POP RIVETING

CONSIDERABLE publicity has been given by your paper to a system of "pop riveting" which claims as a special advantage that the broach used for expanding the rivet is not deformable and may be used repeatedly. Your paper implies that an advantage of this is that the cost of using a fresh broach for each rivet is obviated.

We are manufacturers of rivets and supply these threaded on the broach or mandrel which is used in the British pop riveting process, and we believe our selling price for the combined rivet and broach is considerably less than the selling price of the special rivet used in the alternative process.

The use of the undeformable broach has long been known in this country, but we submit it does not give such good results as the deformable broach which has the advantage that its head is large when it expands the point of the rivet and becomes small before passing through the rivet bore.

A more recent development in this country is the "break-head" mandrel or broach, the head of which is practically flat and compresses or squeezes the rivet in the same way as a pair of snaps, and this has been found to give a better job than is obtainable by other means. It has the advantage, for instance, that it draws the plates together and gives a tight job even when one length of rivet is used to connect plates of considerably different thicknesses. Moreover, squeezing the rivet expands it to fill the hole, even when this is considerably over size, as is bound to occur when rivets are drilled by hand tools in flexible structures, such as stress skin wings and monocoques.

With regard to speed of riveting, there appears to be little difference between the two processes. Pop riveting is a one-man, or rather, one-boy job, and there are several structures in which each boy is now setting rivets at the rate of 1,200 per hour, and over.

GEO. TUCKER EYELET CO. LTD.
Birmingham, R. RUDDUCK.

THE STALLING OF YAWED AND TAPERED WINGS

IN an article in *Flight*, July 16, 1936, Mr. W. E. Gray suggests an explanation for certain observed features of the stalling of yawed and tapered wings. As a first step he suggests that there will be a tendency for a transverse flow near the upper surface of the trailing edge of a yawed aerofoil as a result of a transverse pressure gradient. This suggestion seems to require rather more careful examination than he has given it. In the strictly two-dimensional ideal flow with circulation around an aerofoil, assumed as a basis for the Prandtl theory, it is evident that there will be absolutely no tendency to transverse flow if the aerofoil is yawed. For the flow may then be resolved into a two dimensional flow in planes normal to the aerofoil together with a uniform velocity component along the span which will not affect the equilibrium of the transverse flow. In the case of an actual aerofoil (still assumed to be of indefinite length) there will be a tendency for the *boundary layer* to be carried along by the transverse flow, and when the *boundary layer* breaks away at the stall, this effect will be intensified. The whole effect in the case of a yawed finite aerofoil when stalled, comprises transport of the dead air above the trailing edge towards the downstream wing tip, and this will tend to delay the stall at the upstream end and to accelerate the stall at the downstream end as actually observed. For an aerofoil with swept forward trailing edge (not yawed), the dead air will be transported from the tips towards the centre, thus delaying the stalling of the tips and accelerating that of the centre by comparison with the corresponding aerofoil with straight trailing edge which would be expected to behave more nearly in accordance with the ordinary Prandtl theory of a monoplane wing, on the assumption that all sections have the same maximum lift coefficient. There will, of course, be some transverse flow corresponding to the velocity field of the trailing vortices, and this will be additional to the transverse flow in the boundary layer when the trailing edge is yawed. All these conclusions appear to be in accordance with the recent observations of Mr. Grey and of Mr. Irving at the N.P.L.

As a further example of the fundamental fallacy of the suggestion that the transverse flow in the boundary layer is due to pressure differences, the idea that a reverse effect will occur near the leading edge appears to be entirely without foundation. Actually, a yawed leading edge may be expected to have little effect, because the boundary layer there is thin.

Aerodynamics Department, N.P.L. C. N. H. LOCK.

MR. W. E. GRAY'S comments in your issue of August 13, dealing with my letter of the previous issue, call for some reply. Mr. Gray has difficulty in understanding my reference to spanwise flow and states that it is "a mere bending inward" of the flow, but, surely, if the flow bends inward it has a lateral, or spanwise, component! One may as well eliminate the terms up-wash and down-wash.

I do not know why Mr. Gray should think that I assume that there is no vortex on the down-wind wing tip; I merely suggested that the vortex effect was *accentuated* on the up-wind tip, and *decreased* on the other, thus resulting in earlier stalling of the latter. I am sorry this was not understandable. One appreciates, of course, that the mass of air set in motion by the lateral pressure gradients may be relatively small, but all such flow must decrease lift to some extent, and, moreover, may be sufficient to initiate or delay stalled conditions.

Finally, experiments in the wind tunnel with a series of models, in which the sweep of leading and trailing edges are varied in turn, should not be difficult to carry out. By retaining the same span and area throughout, the aspect ratio would remain constant, and in this way the true effects of sweep would be accurately determined.

R.A.F., Henlow, Beds. C. H. LATIMER-NEEDHAM.

Going Abroad

IN July the A.A. foreign air touring business transacted at Heston was more than double that of the previous month. Thirty-eight carnets were issued and fifty-nine maps were hired out. There was a big exodus of private aeroplanes during the Bank Holiday week-end. Thirty-two left on July 30 and twenty-one on the following day. Most of these, however, were bound for English destinations. It is perhaps not generally known that owners of the Air Touring Card can hire maps, not only for the whole of Europe but for North Africa and for the East as far as Singapore. Maps of the London to Capetown air route will also soon be ready for circulation. A 30s. deposit is payable, in addition to the hire fee of 5s. per map, but in the case of hired aircraft Air Hire, Ltd., assume responsibility for the safe return of maps.

Private Flying

Topics of the Day

Ground Signs

AT no time does one feel so helpless or realise the limitations of the normal aeroplane so well as when one is unable to recognise a town or railway-crossing during a cross-country flight in thick weather.

One often longs to be able to stop the machine for a moment in order to have a good clear think and look, yet the best one can do is to hurtle round in a tight turn while the compass spins and the landmarks look less and less like anything to be seen on the part of one's map covering the appropriate area.

It is easy to say (as I have said before now) that the pilot should carry on until something unmistakable appears beneath the wing, but there are times when it is absolutely essential to discover one's exact whereabouts in order, for instance, to make for the nearest aerodrome before the ground disappears altogether when flying at a safe height.

While on a cross-country flight a few weeks ago I passed over a small town—I think it was Market Harborough—which would have been completely recognisable in such conditions, for the simple reason that its name had been painted on the top of a gasholder. There are quite a few towns which have similarly considered the comfort of the weather-bound aeronaut, and the Standard Car Company, for instance, has gone to great trouble to provide all manner of useful information, which is painted on the roofs of the shops. The ground height and the direction of both Coventry and Castle Bromwich are indicated.

Helping the Helpless

I HAVE not got the least idea of the cost of such sign painting and of keeping the sign legible in this English climate, but it could not be a very serious item in the budget of a town of, say, 10,000 inhabitants or more, or in that of a large business house. Such signs, if the pilot knows that every town or city of a certain size has provided them, would be of immense help both to the private pilot and, on occasion, to the transport pilot working towards an area unprovided with the radio facilities which are so very necessary.

If the towns themselves do not see fit to do anything about it, then some benevolent millionaire might find many less useful ways of spending his money. On the map the average town appears as if it ought to be quite obvious when seen from the air, but, in fact, the railway lines, marked so very clearly, are very thin affairs when examined in thick weather, and the beautifully curving branch line may be nothing more than a spiderish single-track which looks like a mineral railway. Parts of the North of England, incidentally, are a network of these misguiding railroads, and not all of them are shown on the ordinary aviation map.

Real Navigation

WHEN you are bored during a plain cross-country flight, and when you have previously ascertained the cloud-height at your destination, I suggest that you do a little mental or shirt-cuff calculation and climb up through the clouds. I am willing to bet that on your first serious trip of this kind you will come down through them at least five minutes before your estimated time of arrival.

For some reason or other one becomes more and more certain that the calculations are wrong and that one *must* have passed one's destination. Probably the impression is largely gained from the fact that, for once in a way, the pilot obtains a very real impression of speed. I usually omit to allow for the fact that my ground speed is reduced to 60 m.p.h. or less during the climb to and through the clouds, which may take anything up to ten minutes and will add three or four minutes to the flying time.

The last time I went in for this form of flying I checked the machine on its course for nearly half an hour over high country and then allowed myself twenty minutes for the balance of the journey. I came down after eighteen minutes and found that the machine was dead on its course and just five miles short of my objective; whereupon I went up again through the clouds in a temper and came out two miles beyond the aerodrome.

Accurate Flying

ONE'S flying is usually very accurate in these conditions because the air above the clouds is smooth enough to allow one to fly within a degree or so of a previously calculated and checked course. I strongly advise the comparative novice to check his compass course very carefully before going through and to make quite certain that matters are in order at the other end. After coming in to Le Bourget on two occasions, with one of the early morning newspaper pilots, on radio bearings and with a low cloud-base, I can assure everyone that an altimeter reading of less than five hundred feet can be very trying to the nerves when the ground has still failed to put in an appearance. Lots of good men have hit hillsides when trying to be a little cleverer than Nature will ever allow one to be.

Hemmed about as we are with rules and regulations, worried by insurance risks, and suffering from a morbid desire to live to a ripe old age, it is not often that we have a chance of enjoying that most exciting of sports—hedge- or wave-hopping. For those who miss the doubtful thrill of speed after leaving the roads for the sky, I also suggest a bout of cloud-top cross-country work.

If you fly ten feet or less above the top layer you will obtain all the "kick" required out of flying, while continuing to expect a long and prosperous life. Clouds sometimes look excitingly hard, and the view, in any case, is staggeringly beautiful.

INDICATOR.

FROM the CLUBS

Events and Activity at the Clubs and Schools

NOTTINGHAM

THE total flying time for the week ending August 13 was 53 hr. 20 min., this being flown on two machines only. Mr. F. Dawson became a flying member and Mr. W. Walter an associate member. Mr. Jack Pain qualified for his "A" licence.

DONCASTER

Machines of the Doncaster Aero Club flew 23 hr. 35 min. for the week ending August 21.

LONDON

Last week's flying time was 182 hr. 15 min. Messrs. M. G. L. Foster, L. Lewis and F. B. Pelly went solo and Mr. G. M. Masson completed his "A" licence tests.

READING

Mr. C. Nepean Bishop and Mr. Van Deurs eluded the Portsmouth Club's "dawn patrol" and obtained a free breakfast. Last week's flying time was 38 hr. 30 min. Mr. Posnansky is renewing his "A" licence.

C. A. S. C.

Flying time for Sunday, August 23, was 6 hr. 35 min. Messrs. Harris, Arrow, Spicer and Rosam made test flights to qualify for probationary membership. A number of members flew the new school machine, G-AARH.

WITNEY AND OXFORD

Of the twenty-seven flying hours recorded during the week ending August 23, fourteen represented solo flying. New members were Mr. Antony Bailey and Mr. H. A. Buxton. Mr. G. R. Beale-Browne went solo and Mr. H. A. Glogauer obtained his "B" licence.

ABERDEEN

The school succeeded in passing previous records for solo and dual flying time last week. New members include Messrs. Smart, Sorapure and Adam Smith. Sir Alisdair McRobert has been using his B.A. Eagle for extensive cross-countries, mainly to the Orkneys and Shetlands.

REDHILL

During the week ending August 21 Messrs. Hughesden and Goodhew completed their "B" licence night flights, Mr. Rathbone went solo and 101 hr. 55 min. flying was logged. Despite rumours, the Blackburn Segrave has not been sold to Spain and is still available for twin-engined instruction.

BORDER

With three machines again in commission flying time increased considerably during the week ending August 17 in spite of anything-but-favourable weather. Passing motorists on their way to and from Scotland continue to stop at the aerodrome in large numbers for a joy-ride in the Hornet. Mr. Pattinson has gone solo.

PORTSMOUTH

New members of the Portsmouth Aero Club are Messrs. B. W. Buswell, H. Horner, H. Horner, Jnr., R. E. Clear and Lt. D. E. Cox, R.N. Mr. S. P. Reed has qualified for his "B" licence. The total flying time for the week ending August 21 was 53 hr. 40 min., which represents an increase over the average for the past few weeks.

YAPTON

Flying times for August to the 22nd totalled 186 hr. 50 min. New members are Messrs. L. Murphy, R. H. Alington, W. J. Barrow and Frank Miller. Mr. Miller is taking an "A" licence course. The Super Drone was demonstrated on the occasion of a "cocktail patrol" on August 23. Mr. R. W. Compton-Hall has gone solo and passed his "A" licence tests and Mr. Ali Effat has gone solo.

BRISTOL AND WESSEX

Forty-eight hours' five minutes' flying was logged during the week ending August 22. Mr. E. G. Davis has become a pilot member, Mr. J. S. Hobhouse has passed his "A" licence tests and Mr. J. H. Wingate Hill has passed all the tests for his "B" licence, including night flying. On August 23 three machines went to Portsmouth for the "dawn patrol," one gaining a free breakfast. The Club Garden Party will be held on September 5, starting at 3 p.m.

SOUTH COAST

The weather was mixed last week, but over 40 hours' flying was recorded. In the first round of the Gorringe Challenge Trophy Forced Landing Competition the general standard of the entrants was so high that it was difficult to allot prizes. The actual winners were P. Mursell, with E. Parker and Miss Broad second and third respectively. The first meeting of the Junior Instructional Club was held and in spite of the holidays over twenty members were present for the first lecture given by Lord Amherst. New members include Miss France and Messrs. F. C. Walch and H. Ogilvy.

SIR SAMUEL HOARE, during his visit to the third annual Public Schools Aviation Camp at Norwich, chats with Dr. Birchall of Taunton School (who is O/C. the camp) and some of the pupils.

HANWORTH

Mr. P. Hollingshead and Mr. A. B. Scaife have passed their "A" licence tests and Messrs. P. Delaney and W. Hein have become members. Last week's flying time was 79¼ hr. Three machines attended Sunday's "dawn patrol" only to find that a Gipsy Moth is no match for a Gull, which was responsible for the downfall of all three. Preparations are being made for the Garden Party and Air Display to be held on Sunday, September 20.

NORTHAMPTONSHIRE

There was a good attendance of members last Saturday to watch the arrival of contestants in the Contact Air Race. Sir Peter Grant-Lawson paid a hurried visit on his return from Ireland for an hour's instruction prior to departure for London. A new flying member—Mr. F. D. Swann—commenced flying instruction. Mr. Swann starts young, as he has not yet reached his eighteenth year. Major G. Shaw has flown to Belgium in his B.A. Swallow for a fortnight's holiday. A challenge has been issued to a "dawn patrol" on Sunday, September 6. The attack takes place between 8.45 and 9.30 a.m.

BROOKLANDS

The Shipwright Navigation Competition, which was extended to Sunday, August 16, owing to its popularity with members, was won by Mr. Arthur Woods. Dr. Whitehurst came second and Messrs. G. Ryan and K. Anderson tied for third place. Mr. H. Creedy (Air League) has passed his "A" licence tests and the following have become new members: Mrs. Crouchley, Messrs. Upton McIntyre, d'Anacker, Lock, Hampton, Crockatt and Reid. Mr. and Mrs. Colby have joined the ranks of Brooklands private owners by purchasing a Gipsy Moth. The forced landing competition will be held on September 6 and the spot landing competition for the Hart Trophy on September 13.

HERTS AND ESSEX

Since the inauguration of the Club's flying operations at Gravesend Airport on August 11 several members have transferred their flying activities to that branch. In spite of this, flying hours have not decreased, the total time logged during the fortnight ending August 14 being 169 hr. 45 min. New members were: Count A. de Segonzac, Messrs. L. A. Fieldhouse, O. T. Middleton, W. A. Wolf, I. M. Nicoll, R. E. Eyre and S. G. Smith. Messrs. Graham Crump and E. A. J. Koch completed their "A" licence tests. There were fourteen entries in the cross-country competition for the "Wrighton" Challenge Cup last Sunday. Mr. H. J. Romer was the winner with Mr. J. H. Reyner second and Mr. D. C. Mason third. The aerobatic competition for the "Mollison" Challenge Cup will be held next Sunday.

Private Flying

MADRAS

The total flying time for July was 146 hr. 40 min. Mr. S. Bhuyan and Mr. G. D. Armstrong went solo.

BENGAL

The Club was open only for flying by approved soloists during July and consequently the flying time was only 15 hr. 25 min.

CAMBRIDGE

Flying times at Marshall's Flying School, The Cambridge Aero Club and the University Aero Club for the week ending August 23 totalled 105 hr. 30 min. Mr. Feld took his "A" licence, Mr. Worsdel passed the cross-country test for his "B" licence, and Mr. Nooddink passed the Technical Examination for his "B" licence.

NORFOLK AND NORWICH

Mr. F. G. King went solo last week and two new pilot members—Mr. P. C. Bromwich and Mr. George Western, of the Western Brothers—joined the Club. Among the visitors of the week were Messrs. J. and G. Maillot in a Potez from Paris. The President's Trophy Competition takes place next Sunday.

NEWCASTLE

Dual and solo flying time for the week ending August 21 amounted to 88 hr. During the period January 1 to August 20 a total of 1,487 hours' flying has been recorded, which is an increase of 369 hr. over the corresponding period last year. Mr. G. E. Hopper has gone solo and Messrs. R. Leech and W. E. Timm have completed their "A" licence tests. The Club has now taken delivery of its Tiger Moth.

CINQUE PORTS

The strange creaking noise heard overhead last Tuesday week heralded the approach of Ken Waller in his ancient Cauldron. The machine is at Lympne for the International Meeting on August 29 and 30, when it will contrast well with its ultra-modern sister, the latest Caudron Simoun, which does over 200 m.p.h. and is entered for the Cinque Ports Wakefield Cup Race by M. Guy Hansez. The old Caudron has been flown by all the Lympne instructors, who find it a very pleasant machine with a really remarkable take-off. Mrs. Morris Davis has taken delivery of a B.A. Swallow purchased through the Club. Mr. Garcias has gone solo and the following have completed their "A" licence tests:—Col. J. C. Ward, Cdr. A. Price, and Messrs. F. H. C. Taylor, F. G. W. Whitnall and L. A. Tample. New members are R. J. A. Ford, H. G. Tague, A. Bowring, M. A. Phillips, W. H. Gull and P. H. Jones.

A. S. T.

July was quite an interesting month at the Air Service Training, Ltd., schools at Hamble and Ansty. A party of Dutch students from the Netherlands Governmental Flying School at Amsterdam flew to Hamble in two Fokkers for a two-day visit, during which time they were the guests of the school. Mr. Fuchs, the chief flying instructor, was in charge, and in addition to thirteen students, there was a pilot, two wireless operators, and an engineer of K.L.M. On arrival they made a thorough inspection of the school and in the evening attended a guest night at which all flying instructors, R.A.F. and civilian trainees were present. Next morning, the party, accompanied by some of the civilian students, made a coach tour of the local places of historical interest and left for Amsterdam after lunch.

Kashef Effendi, a flying instructor of Misr Airwork, Ltd., Cairo, has joined for an instructors' refresher course and an instructors' blind-flying course, and brought three of his senior students with him, who will remain for over a year to take the instructors' blind flying, navigators' and wireless courses. Mr. Needham has returned for a short refresher flying course, and Mr. Carter, of Durham University, for ground engineering training. Also, Mr. Parkhouse, who took the flying instructors' course in June, has returned for a blind-flying course.

Other new pupils include Mr. Windsor for the "B" licence, Mr. Yamamoto for advanced aerobatics and Mr. Pascalis for the "A" licence. Mr. Lasnauski, of Austria, and Mr. Beach, obtained their "B" licences, while five others took the Air Ministry night-flying tests in readiness to obtain theirs. Four "A" licences were taken by other students.

Mr. G. H. Wright has left the staff of the Central Flying School, Royal Air Force, to join the flying instructional staff at Ansty.

In spite of the abnormally wet conditions during July, 1,583 hours were flown at Hamble and 832 at Ansty.

Mr. R. Grubb, an A.S.T. pupil who won the Folkestone Aero Trophy Race is leaving to take up a flying post with an aircraft production firm.

Mr. T. O. M. Sopwith, a director of the school and the owner of *Endeavour II* has presented a handsome silver challenge cup for competition amongst members of the A.S.T. Sailing Club at Hamble.

Sir Samuel Hoare at the Public Schools Aviation Camp

WHEN Sir Samuel and Lady Maud Hoare attended the annual dinner of the Norfolk and Norwich Aero Club as guests of honour, Sir Samuel promised that he would visit the next Public Schools Aviation Camp.

This promise he fulfilled last week when he and Lady Maud arrived at the Norwich Municipal Airport. They were received by Dr. Harold Birchall, of Taunton School, and Mr. A. A. Rice, the chairman of the club. Each boy was then introduced to them, and Dr. Birchall explained to Sir Samuel the details of the boys' training and the progress that they had made.

Sir Samuel showed great interest in their schools and discussed with them their future plans. After this he commented on the recent improvements made in aircraft designed for the private owner, and the merits of various types of light aeroplanes were discussed with the pupils, who contributed considerably to the subject. Following this Sir Samuel entertained the assembly with reminiscences of his past career, making special reference to the period when he occupied the position of Secretary of State for Air. The schoolboys then conducted their visitors round their own quarters.

The Public Schools Aviation Camp made very good progress during the week. On the Monday, Mr. P. Gardner (Imperial Service College, Windsor) and Mr. R. Stallebrass (Uppingham) successfully completed their first solo flights, and since then all the boys have passed their flying tests for their licences.

Rochester Display in Aid of Charity

SUPPORTED by the Corporation of the City of Rochester, and in connection with Rochester Airport's "Empire Air Week," an ambitious display (which it is hoped to make an annual event) will take place at that aerodrome on Saturday, September 12.

A very complete programme of demonstrations is being drawn up, club aircraft are expected to attend in large numbers, and the proceedings will include an arrival competition. The band of the Royal Air Force will be in attendance. In the evening the proceedings will conclude with a ball.

Her Grace the Duchess of Bedford is the patron, and at her request half the proceeds are to go to the Marie Curie Cancer Hospital and the rest to St. Bartholomew's Hospital, Rochester.

The organising manager is Mr. M. G. Chadwick, and the display offices are at Canute Air Park, Ashingdon, Essex, and the Guildhall, Rochester.

An Eastbourne Addition

IN our report of the Eastbourne Club's "At Home" we mentioned the case of a certain Tiger Moth, which was missed, through no fault of their own, by the judges in the Concours. The Club has since decided (very generously) to give a special cup for the best-kept open machine with the greatest number of hours to its credit while in constant service. This cup will be suitably inscribed and sent to the London Aeroplane Club.

Brighter Club Competitions

READERS may remember that a short time ago (p. 58, July 9) "Indicator" referred to an interesting new type of course-finding competition evolved by the Lancashire Club. An equally interesting variation on the same theme is being made by the Norfolk and Norwich Club in their President's Cup Competition next Sunday.

This event will take the form of a cross-country flight of about thirty-five minutes' duration. The turning points will be natural or otherwise proper landmarks shown on any aviation map, and the longitude, latitude and nature of them will be communicated to each entry by first post next Saturday. From this information, it will be up to each competitor to prepare his own map. At each turning point an observer will be posted to see that each pilot rounds the point correctly and at a height not less than 800 ft. Pilots on completing the course will have to land as near as possible to the aerodrome circle.

Only those who have over twenty hours' solo experience and have passed their forced-landing tests will be eligible.

The trophy, which is a large silver model of one of the club's Moths, was won last year by Mrs. J. F. Crossley, who is now an aerobatic pilot with Mr. C. W. A. Scott's Display.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

THE GRASP OF STEEL : A Gloster Gauntlet of No. 111 (Fighter) Squadron about to take off from Biggin Hill to intercept air-exercise raiders. (*Flight* photograph.)

NEW SQUADRONS

No. 103 (Bomber) Squadron and No. 107 (Bomber) Squadron formed at Andover on August 10. Both these units are being equipped with the light bomber type of aircraft and have been placed under the command of the A.O.C.-in-C., Bomber Command, in No. 1 (Bomber) Group.

MOVES OF SQUADRONS

No. 9 (Bomber) Squadron will move from Aldergrove to Scampton on October 6.

No. 214 (Bomber) Squadron will move from Andover to Scampton on October 6.

No. 101 (BOMBER) SQUADRON

The R.A.F. Station, Bicester, and No. 101 (Bomber) Squadron have been transferred from No. 3 (Bomber) Group to No. 1 (Bomber) Group with effect from August 17.

FORMATION OF STATION FLIGHT

A station flight will form at Mildenhall on September 1, and will include the meteorological section of the Station Flight, Duxford, which will be transferred to Mildenhall on that date.

ALDERGROVE AND NORTH COATES FITTIES

A station flight will form at Aldergrove on September 28.

The R.A.F. Station, Aldergrove, and the Station Flight will be transferred from the Bomber Command to the Training Command and placed in the Armament Group with effect from October 6.

No. 502 (Ulster) (Bomber) Squadron will remain in the Bomber Command, in No. 6 (Auxiliary) Group.

The armament training camp at North Coates Fitties will cease to be known as No. 2 Armament Training Camp with effect from October 6, and a temporary armament training camp will form there on that date.

No. 2 Armament Training Camp will open at Aldergrove on October 6, in the Armament Group under Training Command.

The temporary armament training camp at Aldergrove will cease to exist with effect from that date.

NEW STATIONS OPENED AND OCCUPIED

The undermentioned new Royal Air Force Stations were opened on July 30, on which date a Station Headquarters was formed at each:—

Driffield, Yorks.
Finningley, Yorks (nr. Doncaster).

Squadrons have been ordered to move to these new stations on September 3, as follows:—

No. 58 (Bomber) Squadron and No. 215 (B) Squadron from Upper Heyford to Driffield.

No. 7 (B) Squadron and No. 102 (B) Squadron from Worthy Down to Finningley.

No. 5 FLYING TRAINING SCHOOL

The undermentioned officers and airman pilots have been awarded special assessments as shown hereunder on completion of a course of flying training at No. 5 Flying Training School:—

Special Distinction

L.A/C. Smart, H., and L.A/C. Moore, J.V.

Distinguished Pass.

A.P/O.s M. G. F. Pedley, R. A. G. Petrie, and A. S. Ainslie, L.A/C. Lamb, R. R., and L.A/C. Evans, D. J.

VACANCIES FOR APPRENTICE CLERKS

The Air Ministry announces that an increased number of vacancies is offered to well-educated boys to enter the Royal Air Force as Apprentice Clerks. This career may appeal to many boys who are attracted to Service life and wish to travel abroad but have no liking for a mechanical trade.

The next entries of Apprentice Clerks will be made in October, 1936, and January, 1937, and applications are to be received at the Air Ministry not later than October 1 and January 1 respectively. Candidates must be in possession of an approved school certificate and must on the first day of the month of entry be between the ages of 15½ and 17½; preference will be given to those over 16.

Full information (A.M. Pamphlet 9) may be obtained from the

Inspector of Recruiting, Royal Air Force, Victory House, Kingsway, London, W.C.2. Successful candidates will be required to complete twelve years' regular Air Force service after reaching the age of 18. At the age of 30 they return to civil life, but will normally be given an opportunity of entering the Royal Air Force Reserve and of drawing a gratuity of £100. A limited number may be permitted to re-engage to complete twenty-four years' service, thus qualifying for pension.

For a clerk who has attained the age of 18 and has successfully passed the examination at the end of his course the rate of pay varies from 3s. to 4s. 6d. a day (21s. to 31s. 6d. a week). Opportunities occur subsequently for advancement with increased rates of pay. Free accommodation, food, etc., are also provided, or allowances in lieu. During training Apprentice Clerks receive pay varying from 1s. to 1s. 6d. a day (7s. to 10s. 6d. a week). In addition they are provided with a free outfit, are lodged and victualled free of cost and receive free medical attendance. They also have full opportunity to take part in the social and recreational activities of the units with which they are serving. Apprentices normally receive eighteen months' training in clerical duties, typewriting, practical office routine, shorthand (for Clerks, General Duties), pay and store accounting (for Clerks, Accounting). Their general education will also be continued under a staff of graduate teachers.

GOOD RECRUITING

Under the Royal Air Force expansion programme there has been an increase of personnel of well over 15,000 men and boys of all ranks in the past fourteen months.

The following table of figures from the Air Ministry show the increases in all ranks:—

	May, 1935.	July, 1936.	Increase.
Officers	3,454	4,134	680
Cadets	111	129	18
Aircraftmen	26,517	39,336	12,819
Apprentices	2,049	3,311	1,262
Boy Entrants	315	844	529

These figures indicate that nearly two-thirds of the 22,500 increase due by next March, as stated by Mr. Baldwin over a year ago, have been obtained.

ROYAL AIR FORCE (MIDDLE EAST) DINNER CLUB

Owing to the death of His late Majesty King George V the annual dinner has been postponed until Tuesday, November 10, when it will be held at the Royal Air Force Club, 128, Piccadilly, London, W.1.

No. 70 SQUADRON REUNION

A reunion dinner for the officers of No. 70 Squadron, R.F.C. and R.A.F., will be held at the Royal Air Force Club, 128, Piccadilly, on Friday, October 16. For particulars apply to C. D. Griffiths, Royal Air Force Club.

ADDITIONAL RE-ENGAGEMENTS

In consequence of the programmes of expansion approved by H.M. Government in 1934 and 1935 a substantial number of airmen whose applications for re-engagement could not previously be accepted, have been allowed to re-engage. The Air Council have now decided, in view of the further expansion recently sanctioned, that a limited number of re-engagements in addition to those already approved can be effected. The requisite action will be taken by the Officer i/c Records and notifications sent through the usual channels to all airmen who are selected. It will not be necessary for applications to be re-submitted, except for any airmen who have previously stated that they do not desire to re-engage and now wish to be considered for re-engagement.

INTRODUCTION OF TRADE OF TORPEDOMAN

As an extension of the policy of employing mates to assist fitters, it has been decided to introduce a sub-trade of group V to be known as "torpedoman," airmen of this trade being employed as assistants to fitters (torpedo). The detailed duties of the trade will be announced in a later order. Torpedomen will be required to undertake work of a somewhat more responsible character than mates and a higher rate of duty pay has therefore been authorised for them.

The course of instruction for this trade, to be undergone by selected mates, will be of approximately six weeks' duration and will be held at the R.A.F. Station, Gosport. Torpedomen will be eligible for duty pay at the rate of 6d. a day under the same conditions as govern the issue of duty pay to mates. Mates selected for training as torpedomen will receive, whilst undergoing training, their duty pay of 3d. a day, similarly to mates who are being trained as flight mechanics or flight riggers. The reclassification of torpedomen as aircraftman 1st class, and leading aircraftman will be effected by the Officer i/c Records.

ROYAL AIR FORCE GAZETTE

London Gazette, August 18, 1936

General Duties Branch

Flt. Lt. A. M. Carey is transferred to the Reserve Class A (August 17); Flt. Lt. H. F. Boss-Walker relinquishes his short service commission on transfer to the Royal Australian Air Force Reserve (August 16); F/O. V. P. J. G. Doherty is dismissed the Service by sentence of General Court Martial (August 1).

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

Flt. Lt. J. R. Brown, D.F.C., is transferred from Class A to Class C (August 4).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Group Captain.—C. H. B. Blount, O.B.E., M.C., to Headquarters, No. 2 (Bomber) Group, Abingdon, 6.8.36; for duty as Senior Air Staff Officer vice Group Capt. L. J. E. Twistleton-Wykeham-Fiennes.

Wing Commanders.—W. R. D. Acland, D.F.C., A.F.C., to No. 70 (B.T.) Squadron, Iraq, Hinaidi, 1.6.36; to command vice Wing Cdr. W. Sowrey, D.F.C., A.F.C. A. J. Capel, D.S.O., D.F.C., to School of Army Co-operation, Old Sarum, 6.8.36; to command vice Group Capt. C. H. B. Blount, O.B.E., M.C.

Squadron Leader.—T. B. Bruce, M.C., to Headquarters, No. 24 (Training) Group, Halton, 12.8.36; for Air Staff (Maintenance Liaison) duties.

Flight Lieutenants.—P. S. Blockey, to No. 27 (B) Squadron, Kohat, India, 20.7.36. L. H. Anderson, to No. 9 Flying Training School, Thornaby, 30.7.36. D. W. Baird, to No. 1 Armament Training Camp, Catfoss, 6.8.36. B. A. Casey, to No. 1 School of Technical Training (Apprentices), Halton, 8.8.36. R. T. Cazalet, to R.A.F. Station, Mildenhall, 8.8.36. A. R. Collins, to Headquarters, Armament Group, Eastchurch, 10.8.36. T. N. Coslett, to No. 2 Flying Training School, Digby, 8.8.36. R. B. Harrison, to No. 1 School of Technical Training (Apprentices), Halton, 8.8.36. A. L. Holland, to R.A.F. Station, Gosport, 8.8.36. W. H. Husbands, to Aeroplane and Armament Experimental Establishment, Martlesham Heath, 8.8.36. J. J. Murphy, to No. 1 School of Technical Training (Apprentices), Halton, 8.8.36. T. H. L. Nicholls, to No. 57 (B) Squadron, Upper Heyford, 12.8.36. C. H. Smith, to School of Naval Co-operation, Lee-on-the-Solent, 8.8.36. J. R. Addams, A.F.C., to Aeroplane and Armament Experimental Establishment, Martlesham Heath, 9.8.36. C. P. Villiers, to No. 102 (B) Squadron, Worthy Down, 10.8.36. F. H. Woolliams, to Headquarters, Fighter Command, Stanmore, 30.7.36.

Flying Officers.—J. J. Watts, to No. 11 (B) Squadron, Risalpur, India, 20.7.36. F. J. Manning, to No. 7 Flying Training School, Peterborough, 10.8.36. R. G. Bowditch, to No. 1 School of Technical Training (Apprentices), 8.8.36. P. C. Lawrence, to Administrative Wing, Halton, 4.8.36. W. H. N. Turner, to No. 9 Flying Training School, Thornaby, 25.7.36.

Pilot Officers.—A. R. Atkins, to No. 206 (G.R.) Squadron, Manston, 14.7.36. D. K. Banks, to No. 206 (G.R.) Squadron, Manston, 21.7.36. E. Banthorpe, to No. 206 (G.R.) Squadron, Manston, 26.7.36. J. A. Chorlton, to No. 206 (G.R.) Squadron, Manston, 14.7.36. D. Davies, to No. 34 (B) Squadron, Abbotsinch, 14.8.36. P. J. K. Pike, to No. 206 (G.R.) Squadron, Manston, 26.7.36.

Acting Pilot Officers.—The following Acting Pilot Officers are posted to R.A.F. Depot, Uxbridge, on 6.8.36, on appointment to short service commissions:—J. F. H. Booth, B. Brooke, A. R. Cooper, D. M. Doran, J. S. Douglas-Cooper, J. S. Dunlevie, L. H. Hunt, R. H. McClatchey, B. A. Miller, W. H. Powdrell, R. H. Rice, G. V. T. Shaen-Carter, G. E. Watkins.

The following Acting Pilot Officers are posted to R.A.F. Depot, Uxbridge, on 4.8.36, on appointment to short service commissions:—T. H. Clarke, C. G. H. Crusoe, J. R. Havers, G. C. Kain, H. J. Lyon, B. A. Mortimer, H. B. M. Pearson, C. D. W. Price, H. C. Tootal, R. G. M. Walker, E. A. Warfield, R. F. Weatherill, G. L. M. Schrader, J. G. P. Greenwood, F. C. Griffiths, E. Holden, A. E. Hyde-Parker, R. H. Hain, D. F. Laslett, G. W. D. V. Le Suer, R. E. G. Morewood, D. G. Tomlinson, C. T. Norman, E. J. Palmer, L. H. W. Parkin, W. A. Sykes, M. Wyatt, M. V. Baxter, C. L. G. Back, R. M. Cowell.

Stores Branch

Squadron Leader.—W. C. Green, M.C., to No. 3 Stores Depot, Milton, 3.8.36.

Flight Lieutenant.—R. H. Latham, to R.A.F. Station, Abbotsinch, 12.8.36.

Medical Branch

Flying Officer.—G. P. Jones, to No. 2 Flying Training School, Digby, 10.8.36.

Chaplains' Branch

Revd. S. H. Keen, to R.A.F. Station, Manston, 4.8.36; for duty as Chaplain-in-Charge Presbyterian and Methodist personnel. Revd. G. M. Rees, to R.A.F. Station, Gosport, 10.8.36; for duty as Chaplain (Church of England) vice Revd. A. R. J. Symes. Revd. A. R. J. Symes, to R.A.F. Depot Uxbridge, 13.8.36; for duty as Chaplain (Church of England) vice Revd. G. M. Rees.

HERE and THERE

Full Steam Ahead at Coventry

WORK is to begin immediately on the new aircraft engine factory to be operated at Radford, Coventry, by the Daimler Company. It is estimated that the works will cost more than £500,000, and that when complete it will provide work for nearly 1,000 men. It is stated that production will be laid out for Bristol components, primarily consisting of crank cases, tappets, front covers, oil sumps, priming systems, air intakes and petrol pumps, and for Lord flexible engine mountings.

The plans provide for the completion of the factory within the short period of four months, and production is expected to start within eight months. The works will cover seven acres.

Meanwhile, speedy progress is being made with a similar undertaking under the control of the Standard Company at Canley, while details of the proposed Rover and Humber-Hillman factories are expected at any moment. The Alvis factory—which, in addition to making components under contract, is making its own range—has already started production.

It is thought that within the next year Coventry will have at least six engine and aircraft factories, employing nearly 10,000 men.

Lympne's Big Show

THE Cinque Ports Flying Club folk are looking forward with considerable confidence and eager anticipation to their fourth international rally, which takes place at Lympne this week-end. Apparently there is no danger of the recent Week-end Aerien having stolen their limelight, for a record number of foreign guests—probably over 50—is expected.

Apart from the social side, there should be a first-rate flying display. No. 19 Squadron are to stage their tied-together flight aerobatics as the "high spot" of the Saturday afternoon programme. Three famous German pilots, Herr Kropf, Herr Forster and Fraulein Ilse Fastenrath (the youthful pilot who delighted the Lympne crowd last year) will give an aerobatic display on Sunday, and Mr. Ken Waller will fly the 1912 Caudron. Various other machines will be demonstrated.

Last, but not least, there will be the Wakefield Trophy Race over three 48-mile laps. There are eighteen entries. The heats will be flown on Saturday and the final on Sunday.

Both days' displays will be open to the general public, admission to each being 1s., 2s. 6d. or 5s. (cars, 1s.). There is free admission for air visitors.

Viscount Willingdon, president of the Cinque Ports Club, and Lady Willingdon, will present the prizes on Sunday.

Pictorial Commentary on British Aviation

AMONG the best film importations from America in recent months have been the "March of Time" news "magazines." Vivid photography and virile, authoritative commentary have sealed their success in this country, and in order to handle the expanding business a new company has been formed over here.

The short film of various aspects of British civil aviation shown at the Savoy last week was treated in the same breezy, convincing fashion as the American-made pictures. Interviews with controlling figures, including Lord Swinton, gave it the stamp of authenticity. The "shots" taken on our internal and Empire air routes in conjunction with judiciously synchronised commentary could hardly fail to bring a blush of pride to anyone associated with Britain's air traffic system, described by the commentator as the world's finest.

Exhibiting at Johannesburg

AMONG firms which have announced their intention of exhibiting at the South Africa Empire Exhibition (Johannesburg, September-January) are the English Steel Corporation, Ltd., Thomas Firth and John Brown, Ltd., and Firth-Vickers Stainless Steels, Ltd.

No. 1 (F.) Squadron.

No. 19 (F.) Squadron.

No. 43 (F.) Squadron.

No. 55 (B.) Squadron.

No. 56 (F.) Squadron.

MORE R.A.F. UNIT BADGES

HIS MAJESTY THE KING has graciously approved the following badges for six more squadrons of the Royal Air Force. The mottoes can be read on the scrolls below the badges. The descriptions of the badges, as drawn up by Chester Herald, are as follows:—

No. 1 (Fighter) Squadron: The numeral "1" winged.

No. 19 (Fighter) Squadron: Between wings elevated and conjoined in base, a dolphin, head downwards.

No. 43 (Fighter) Squadron: A gamecock.

No. 55 (Bomber) Squadron: A cubit arm, the hand grasping a spear.

No. 56 (Fighter) Squadron: A phœnix.

No. 216 (Bomber Transport) Squadron: An eagle, wings elevated, holding in the claws a bomb.

No. 216 (B.T.) Squadron.

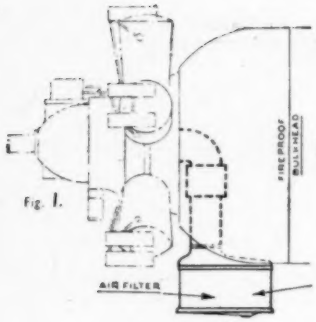


Fig. 1.

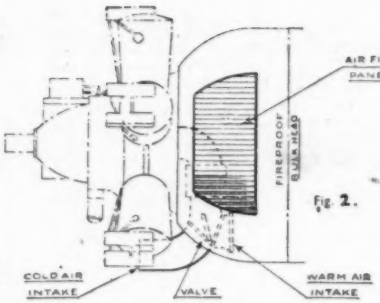


Fig. 2.

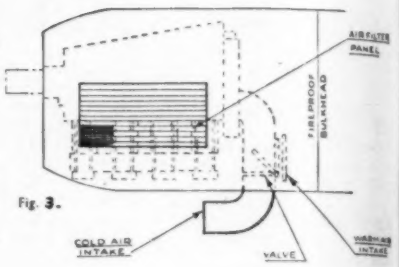


Fig. 3.

KEEPING OUT THE DUST

A Range of Air Filters by Vokes : Application to Radials and "In Lines"

THE dust raised by airscrews during running-up can effect enormous reductions in the inter-overhaul periods of an aero engine. Its abrasive properties soon manifest themselves if it is permitted to mix with the oil or become embedded in the pistons. On the sandy aerodromes of the East the problem becomes more acute.

To combat this evil Vokes Ltd., have designed a series of air filters. They are of two basic types; one, embodied directly in the air intake system, is a model which has been fitted to Armstrong Siddeley engines for the past two years or so, and with which all machines of the South African and Egyptian Air Forces are equipped, and the second, known as the panel type, is fitted into the engine cowling. The variety used on the Siddeleys is also fitted to supercharged Kestrels and the panel type on the unsupercharged models of this engine.

One filter, known as the Protectomotor, has a genuine 99.9 per cent. efficiency, but owing to the fact that it requires to be of rather large size when fitted in present-day aircraft its aeronautical uses are limited. Some years ago the company evolved a filter incorporating similar principles, that is with corrugations of filtering material presenting a large area in a compact space. This type was known as the Five-Ply and could be used either dry, in which case it was washed in petrol or paraffin and dried before being replaced, or with a special triple filter oil. In the latter case it was also washed in petrol before re-oiling. This model again required to be of somewhat large size, and, in consequence, the company is now producing the Three-Ply type exclusively. This embodies two layers of fairly fine-mesh gauze interposed with one layer of special fabric. This is usually washed and re-oiled after every ten hours' flight.

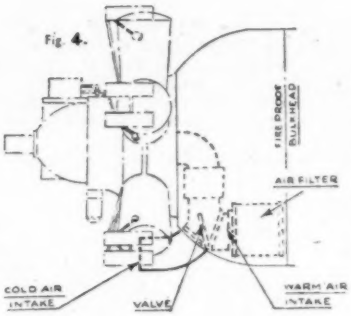
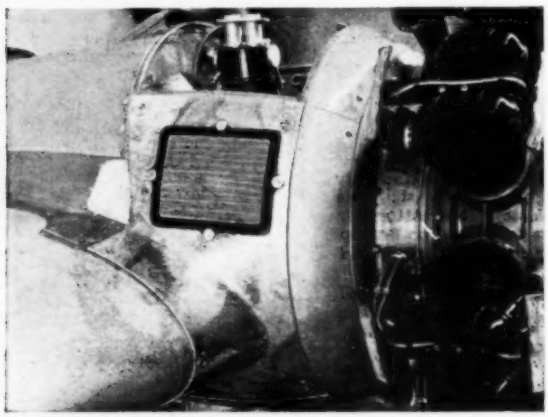


Fig. 4.

Four typical schemes for embodying Vokes air filters. The first two are in use on Siddeley engines; the third is an application to an inverted in-line unit; and the fourth is practical where there is plenty of space beneath the cowling.

In service it was found that, as these filters were fitted externally, the oil tended to dry off in a dive. A small deflecting shield is now incorporated to prevent the direct impact of air on the filter surface.

There are various methods of application. A streamline filter in a suitable casing can be attached to the carburetter intake, this arrangement having been applied successfully to Armstrong Siddeley engines. With the panel type the filtering medium forms part of the engine cowling and adds no extra weight or air resistance, although it offers a very large filtering area. The air passes through the panel at a low velocity, thus aiding the cleaning process, and traverses the engine bay, which is sealed from the rest of the machine by the fireproof bulkhead, finally to enter the warm-air intake of the carburetter. An optional cold-air intake in provided for full-power operation, but as all the ground running is done with the warm-air intake in action, the air is cleaned under practically all conditions. Where room is available beneath the cowling another scheme can be used. In this case the cleaner can be of cylindrical or any other convenient shape. An air scoop is provided in the cowling for the entry of the air to the engine bay and an optional cold-air intake is also provided for full throttle running.



A panel-type Vokes air filter as applied to a Cheetah IX installation on a convertible Airspeed Envoy for South Africa.

Out of Bounds

THE wording of the Air Ministry's Notice to Airmen (No. 119 of the year 1936) regarding the flying of aircraft to Spain is as follows:—

> In view of the decision of His Majesty's Government to prohibit the export of aircraft to Spain, Spanish possessions and the Spanish zone of Morocco, any pilot convicted of an offence against the Air Navigation Order or Customs Acts by reason of having made a false declaration to the Customs authorities in respect of the destination or other particulars of an aircraft, will come under the consideration of the Secretary of State for Air, with a view to the cancellation or suspension of his pilot's licence. All pilots are warned that a serious view will be taken of any attempt to deliver aircraft directly or indirectly to Spain or the above-mentioned territories in evasion of the Government prohibition.

A leading article on this subject appears on p. 215.

A high-altitude test flight with full military load by Mr. P. W. S. Bulman on the Hawker P.V.4 general-purpose dive bomber biplane. (*Flight* photograph.)

A BRITISH DIVE BOMBER

The Hawker P.V.4 : 215 m.p.h. with Pegasus X Engine : Dive Bombing with 1,000 lb. Projectile Load

THE last Air Ministry competition for general-purpose machines (specification G.4/31) brought forth from the Hawker works a private venture type designated the P.V.4, but commonly referred to as the Hawker Dive Bomber because its design was planned with special reference to the diving method of bombing attack. This did not entail the sacrifice of performance or load-carrying capabilities, for, with the Bristol Pegasus engine, its speed and climb were outstandingly good and its military load heavy and varied.

In appearance and construction the machine resembles a scaled-up Hart, but is modified in detail to cope with the stresses imposed by diving at over 300 m.p.h. with a 1,000lb. bomb load beneath the wings. Notwithstanding this, however, the structural weight achieved is remarkably low, being only 27½ per cent. of the fully loaded weight.

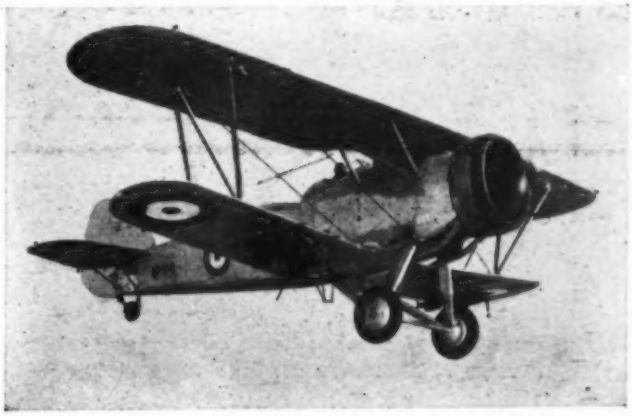
Capable of operating efficiently as a day or night bomber and of fulfilling the exacting requirements from a general-purpose aircraft, the P.V.4 was designed to carry, in addition to the usual fixed equipment, a Vickers gun with 600 rounds of ammunition, a Lewis gun and six 97-round magazines, night-flying gear, a 250 or 1,000lb. bomb load, four sighter-bombs, a desert emergency load of 140lb., and W/T and R/T equipment.

The P.V.4 was designed in the first instance to take one of the new Bristol Pegasus X moderately supercharged radials rated at 800/840 h.p., although the prototype appeared first with a 690 h.p. Pegasus III. This unit gave a maximum speed of 180 m.p.h. at 5,000ft., and at 15,000ft. the machine would cruise at 152 m.p.h. for 790 miles. The climb to 10,000ft. occupied only 8.2 minutes and 15,000ft. was reached in 14.5 minutes. A service ceiling of 22,000ft. was obtainable. With the fully supercharged Pegasus IV, rated at 640/670 h.p. at 11,500ft., the following results were obtained: Maximum speed, 200 m.p.h.; cruising speed at 15,000ft., 172 m.p.h.; range at 15,000ft., 675 miles; climb to 10,000ft. 8.5 minutes; climb to 15,000ft. 12.6 minutes; service ceiling, 25,000ft.

The installation of the Pegasus X brought about still further advances, the maximum speed being no less than 215 m.p.h., which from a large, radial-engined, general-purpose biplane must be considered a brilliant achievement. A standard pattern of Bristol medium-chord ring cowling with nose-type exhaust collector-ring is incorporated, and the airscrew is a two-bladed wooden type. Actually the engine installed for tests in the P.V.4 was the original Pegasus X which performed the type test for its series. In addition to 328 hours bench running, it has done about 100 hours in the air, an engine speed of 3,050 r.p.m. repeatedly being attained during diving tests. The normal r.p.m. are 2,250.

In view of the considerably heavier loading, the increased size and heavier construction necessitated by the more arduous duties, the performance figures attained with the P.V.4 compare very favourably with those of the Hart equipped with similar engines.

Although the constructional principles employed are similar to those used for the Hart, the overall dimensions of wings, fuselage and tail unit are larger. The main data are as follows: Top span, 40ft.; bottom span, 32ft. 2in.; length 29ft. 10in.; height, 11ft. 10in.; wing area, 382.5 sq. ft.; wing loading, 17.4lb. sq. ft.; undercarriage track, 6ft. 7in.; gross weight, 6,650lb.



The general lay-out of the Hawker P.V.4 may be gathered from this view. The resemblance to previous Hawker two-seaters is pronounced. (*Flight* photograph.)

Engines in the Tropics

BRISTOL Pegasus II engines employed in Royal Air Force machines throughout the Middle East, Iraq and Far East Commands are, it is stated, operating with entire satisfaction up to the standard overhaul period of 480 hours.

No top overhauls are as a rule given during this period, but individual cylinders are checked for compression-tightness at intervals of 25 hours, and, where it is found to be necessary, they are serviced accordingly.

Such a creditable record of durability in the tropics affords an instance of the exceptional dependability of these units under adverse climatic conditions

THE INDUSTRY

Heat-resisting Steels

DEALING with steel having high rigidity and freedom from appreciable scaling at temperatures up to 1,100 deg C. a well illustrated catalogue has recently been issued by Hadfields, Ltd., of Sheffield, under the title of "Heat-Resisting Steels."

Miles Whitney Straight Price

WHITNEY STRAIGHT, LTD., inform *Flight* that it has been decided to fix the retail price of the new Miles Whitney Straight aeroplane at £985. The increase in price is accounted for by the improved specification, which includes such refinements as fully shock-proofed mounting of instrument panels, and independent electric petrol gauges on the dashboard.

Hangar for Penang

A HANGAR having a depth of 99 ft. and width of 100 ft. has been ordered for use at the Penang Aerodrome. It is being supplied by A. and J. Main and Co., Ltd., of Vincent House, London, S.W.1 and British material has been specified throughout. The doors are designed so that there will be a clear opening of 98 ft. giving an unobstructed height of 25 ft. The addition of a lean-to will provide accommodation for stores and machine and repair shops.

Luton to Uxbridge

CAPTAIN C. H. LATIMER-NEEDHAM, the designer of the Luton Buzzard, recently described in *Flight*, and other light aircraft, is relinquishing his position as Education Officer, R.A.F., at the end of the month, and will take over the post of managing director and chief designer of Luton Aircraft, Ltd. The company is shortly moving to a new and larger factory now being built near Uxbridge. The aerodrome at Barton will be retained as a testing ground only.

A Putney Appointment

IT is announced that Mr. A. W. Culver has been appointed sales manager to Vokes, Ltd., of Putney. Mr. Culver was for seventeen years with the Cities Service Oil Co., Ltd., latterly occupying the position there of sales manager.

His knowledge of oil and fuels will be of great value to Vokes, Ltd., who, as readers of *Flight* know, manufacture air and oil filters and silencers for aircraft and automobile work.

Vokes, Ltd., was converted from a private to a public company in June, 1936, with Sir Ian Stewart Richardson, Bt., as chairman and Mr. C. G. Vokes as managing director, the other director being Mr. E. L. W. Byrne. The company has recently made extensions to its factory at Putney in order to cope with considerably increased orders.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

DAGNALL AIRCRAFT, LTD. (317,483).—Private company, registered August 14. Capital, £100 in £1 shares. Objects: to carry on the business of engineers, founders, smiths, aeronautical experts, consultants, etc. The first directors are to be appointed by the subscribers. Registered office: 57, Conduit Street, London, W.1.

K.L.B. ELECTRIC, LTD.—Private company, registered August 13. Capital, £100 in £1 shares. Objects: to carry on the business of electrical engineers and contractors, manufacturers of radio, public address and television apparatus, electric signs, etc. The permanent directors are:—Henry A. C. G. Barker (director of Air Pageants, Ltd., and joint general manager of Jubilee Air Displays, Ltd.); James H. King (director of Air Pageants, Ltd., and joint general manager of Jubilee Air Displays, Ltd., director of McEwans, Ltd., and other companies); Wm. J. H. Lambert. Registered office: West India House, Leadenhall Street, London, E.C.3.

IMPERIAL AIRWAYS (BERMUDA) LIMITED, was registered as a private company on August 22, with a nominal capital of £10,000 in £1 shares. The objects are to carry on in Bermuda and elsewhere the business of an aerial transport company, and in connection therewith to act as agents of and in conjunction with Imperial Airways Limited and its associated and subsidiary companies; to manufacture, repair and deal in aeroplanes, etc. The directors are the Rt. Hon. Sir Eric Geddes, G.C.B., G.B.E., K.C.B., chairman of Imperial Airways Ltd.; Geo. E. Woods Humphery, C.B.E., managing director of Imperial Airways Ltd.; Harold Burchall, D.S.O., general manager of Imperial Airways Ltd.; Kenneth M. Beaumont, D.S.O., solicitor. The registered office is at Airway Terminus, Victoria Station, S.W.1.

CAPRONI AGENCY CORPORATION (ENGLAND), LIMITED, was registered as a private company, on August 21, with a nominal capital of £1,000 in £1 shares. The objects are to undertake agencies in the British Empire for the sale of and dealing in aeroplanes, seaplanes, flying boats, and other machines for aerial transit; motor cars and vehicles generally; launches, boats and other articles manufactured by the following Italian corporations: Soc. An. Aeroplani Caproni: Soc. An. Fabbrica Automobili Isotta Fraschini di Milano; Soc. An. Industria Specializzata Strumenti Aeronairgazione de Ponte S. Pietro: Soc. An. Officine Meccaniche Italiane di Reggio Emilia, and any other corporation or companies associated therewith. The directors are: Edmund Howard, architect; Edgardo M. Fronteras, aircraft engr.; George W. Miller, automobile engineer. The registered office is at 7, North Audley Street, W.1.

INCREASE OF CAPITAL

The nominal capital of PARNALL AIRCRAFT, LTD. (Yate Aerodrome, Bristol), has been increased by the addition of £150,000 beyond the registered capital of £300,000. The additional capital is divided into 600,000 shares of 5/- each.

NORMAN EDGAR (WESTERN AIRWAYS), LTD. (Aircraft dealers and air transport contractors, etc., 40, Broad Street, Bristol, 1).—The nominal capital has been increased by the addition of £12,500 in £1 ordinary shares, beyond the registered capital of £7,500.

AERONAUTICAL PATENT SPECIFICATIONS

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.).

(*Published August* 13, 1936.)

16163. LUMB, C. F.: Structures formed of metal or fabric sheetings (450,395).

(*Published August* 20, 1936.)

33632. IRVING, H. B.: Aeroplanes (450,676).

2317. BOUR, E. F.: Airscrew for aircraft with automatically variable blade-pitch (450,854).

2844. COLBOURNE, J. H.: Method of and means for controlling the movement of aeroplanes when landing or travelling on land (450,771).

3280. CHANCE BROS. & CO., LTD., and HALLETT, L. B. H.: Wind-direction indicators for aerodromes (450,878).

22139. AEROPLANES MORANE-SAULNIER, SOC. ANON. DE CONSTRUCTIONS AERONAUTIQUES.: Structure of wings or other parts of aircraft (450,738).

40. BRISTOL AEROPLANE CO., LTD., and FEDDEN, A. H. R.: Supercharged internal combustion engines for aircraft (450,587).

4037. BEADON, R. R. & C.: Landing and take-off gear for aircraft (450,923).

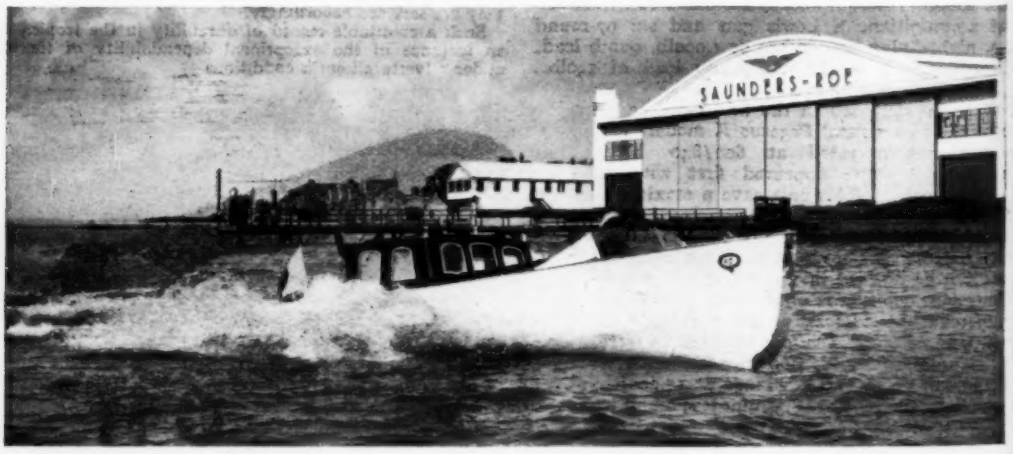
10413. FAIREY AVIATION CO., LTD., and ORDIDGE, F. H.: Retractable undercarriages for aircraft (450,929).

(*Published August* 27, 1936.)

2574. MARCONI'S WIRELESS TELEGRAPH CO., LTD., and KEMP, R. J.: Navigation-aiding wireless systems for use in connection with aircraft (450,978).

3443. SHORT BROS. (ROCHESTER AND BEDFORD), LTD., and GOUGE, A.: Construction of wings for aircraft (451,241).

16577. GENERAL ELECTRIC CO., LTD., and WALDRAM, J. M.: Beacons for aircraft and the like (451,145).



NAUTICAL AND AERONAUTICAL: This 17-knot cabin motor launch has just been delivered by Saunders-Roe, Ltd., to Mr. W. G. Vernon-Smith, a director of the Bristol Aeroplane Co., Ltd. Among other recent orders held by Saunders-Roe may be mentioned one for two motor lifeboats for the R.N.L.I.